AN ARGUS SPECIALIST PUBLICATION No 12 £1.50

SPACE VOYAGER

VOLCANOES ON VENUS

PATRICK MOORE INVESTIGATES

SHOCKWAVE ASTRONOMY

BIG BANG EXPLODED?

DR WHO COMES OF AGE

TWENTY-ONE YEARS ON

V EXCLUSIVE REPORT ON THE NEW SERIES

MODELLERS 2 BRITISH SPACE SHIP DIAGRAMS INSIDE

ISSUE No. 12. DECEMBER 1984/JANUARY, 1985 ISSN 0264-2301

SPACE VOYAGER

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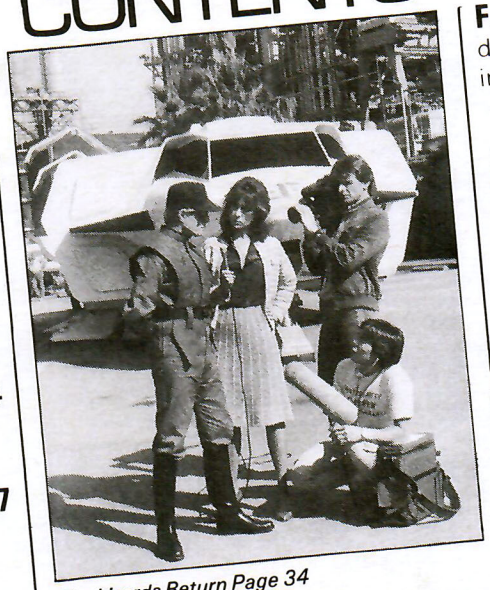

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CAPTAIN'S LOG

It is an ordinary, and on the face of it, a pretty innocuous chair, this chair which at present I contemplate. Comfortable, constructed soundly of wood, and probably one of many turned out every day by Commonplace Chairs Ltd of Cricklewood, but for me it is first cousin to unique. If I dare sit down who knows what will happen.

And yet, I dare to take possession of this enchanting seat, which can carry a person to the stars and through time. Wow! Some chair. You bet it is some chair, for it is the Editor's chair for *Space Voyager*, and publisher Cliff Wilson has just asked me if I would care to occupy it. Care to occupy it? I'm off and running out of his door with it before he can change his mind!

I feel a bit like Neil Armstrong in his Apollo couch, or James Kirk with the Captain's chair on the Enterprise. For a journalist who is also a space and SF fan this is *the* chair. And here I am.

Some of you will already know me, many more of you will have read the articles by me which have already appeared in *Space Voyager*, and some of you will be wondering who I am.

Hello to all of you. I hope to follow in the footsteps of former editors Ray Rimmel, Mat Irvine and Ian Graham (once and for all, no relation) in maintaining the editorial mix of *Space Voyager*.

As Ian Graham mentioned in his last editorial, *Space Voyager* is a bit of a rag-bag of overlapping interests – space fact, fantasy, SF, with modelling, computing and a few other topics thrown in from time to time.

So, why am I here? I've been a journalist all my working life, and writing for *Space Voyager* almost since its inception. I don't think any other writing has ever given me more pleasure – after all what a wonderful excuse to chat to some of my favourite people for hours, under the guise of interviewing them.

I've been an SF fan at least since the first time *Dr Who* hurrumph-tee-tumphed onto the screen 21 years ago and a keen follower of all aspects of the exploration of space, and I have at last acquired my own computer, though at present attempts to control the beast usually result in me staring at it in mystification. On modelling I'm not too hot, but I have a strong feeling that I'm going to be persuaded . . . and I love to read and watch SF.

In short, I think and hope I'm a typical reader as well as the Editor, and that is pretty much the criterion I will be applying to what appears in coming issues.

By the time you read this I'll have been esconsed in the Captain's chair for nearly three months, and will have already made some of the decisions. I hope you enjoy reading this first issue as much as I've enjoyed preparing it, and I hope our future voyages will continue to please you.

This issue

Space Voyager this issue covers everything from start to finish – literally – with the start covered by Andrew Nimmo's ideas on formation of stars and planets, through to the finish of our own particular planet, with various gloomy prognostications on how the earth will be lost by David Hardy.

We come back to the present with Ian Graham's report on the world's aerospace shop-window, Farnborough Air Show, with a comprehensive Shuttle update by Geoff Endacott.

Edging a little into the future Mark Eveley packs his zero-G bucket and spade to tell us all about 21st century holiday resorts and we celebrate the 100th birthday of the Greenwich Meridian.

The lizards of *V* were vanquished earlier this year . . . or were they? It seems not, for John Peel reports on the production of a new series which will doubtless rob us all of sleep again in the New Year. New *Doctor Who* Colin Baker will be battling Cybermen and *Blake's 7* isn't quite dead yet. We have the info.

Also this month there are interviews with Gene Roddenberry, the man who created *Star Trek*, with one of the scriptwriters David Gerrold, and with two other space travellers, Peter Davison and Sandra Dickinson.

There are goodies to win in competitions, lots of your letters and book and product reviews, and talking of competitions leads naturally onto that bit of whimsy known as the caption competition . .

Winner

In issue 10 we invited you to let your imaginations play with a photo of Luke Skywalker leaning against a spaceship festooned with more than its fair share of the surrounding vegetation. Was it an X-wing – or maybe Scorpio on Gauda Prime? No matter, the caption suggestion which most had your Captain chuckling was send in by Mr A M Hayes, of Davies Avenue, Leeds – Luke is looking at a driving examiner, out of shot, who says *'I'm sorry, Mr Skywalker, but I'm going to have to fail you . . . '*

Caption Comp

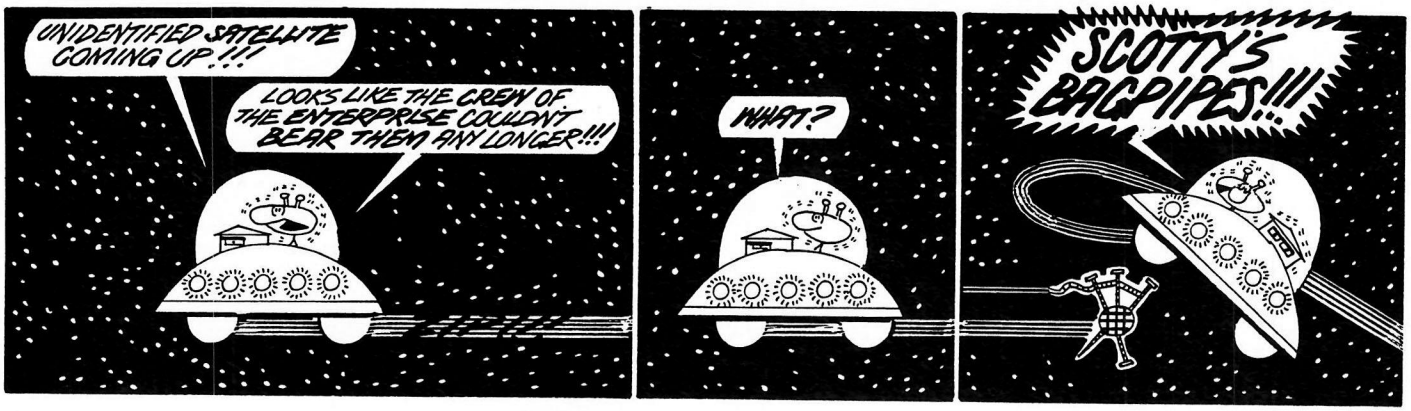
This month's Paramount photo features Admiral/Captain, James T Kirk, on the Bridge of the Enterprise. Why does he look so worried? Is Spock threatening to cook Plomeek Soup? Has Kevin Riley remembered Kathleen ('one more time')? Do sensors show a spaceship loaded with Tribbles and Harry Mudd coming within range, or has the good Admiral/Captain got indigestion? You tell us, in a few apposite words, and send your entry to

Caption Competition
Space Voyager
Wolsey House
Wolsey Road
Hemel Hempstead
Herts HP2 4SS

Entries to arrive before December 15, and the one which most appeals to the Editor's sense of humour will receive an extra Christmas present of a year's subscription to *Space Voyager*.

PLUTONIUM PETE

By ROBINSON


UNIDENTIFIED SATELLITE COMING UP!!!
LOOKS LIKE THE CREW OF THE ENTERPRISE COULDN'T BEAR THEM ANY LONGER!!!
WHAT?
SCOTTY'S BAGPIPES!!!

DATA BANK

It's for you-oo

British Telecom's Spaceline service has been receiving up to 18 000 calls a week, from people wanting to hear about subjects ranging from space walks to black holes.

The idea of Dr David Whitehouse of the Mullard Space Science Laboratory in Surrey, part of University College, London, the talks link up with Telecom's other space service, the shuttle 'hot-line'. Linked through the international system, callers can listen in to live conversations between crew and Mission control for most of a mission. The number is 010-1-900410-6272, and, say Telecom, a typical three minute call will cost you £1.62 . . .

Video First

Goonhilly earth station has notched up a first in providing a direct satellite link to distribute a video single across the Atlantic. Chrysalis Records used the new Brightstar satellite to transmit Spandau Ballet's appropriately named *Communications* to viewers of American TV channel Music Television. Brightstar is jointly owned by the UK's Visnews Group and Western Union in the States.

Star Trek 4 Latest

As of October 10 all but one of the regulars have signed for Trek 4 – the exception being William Shatner who is still negotiating. The fourth Trek film seems set to start production next summer – a production number has been assigned. The Enterprise sets are still intact and standing. Leonard Nimoy will direct, and Harve Bennett produce.

Save your stamps

Science fiction fandom brings world-wide friendship – and that means a lot of letters.

Those letters can mean more than just keeping in touch with fellow fans; they can help to find the cause of cot deaths.

Colin Baker has passed on the address of someone who will sort and sell used postage stamps for the Foundation for the Study of Infant Cot Deaths.

The address is

Mr Alan Pryer, 51 Manor Drive,
Hinchley Wood, Esher, Surrey
KT10 0AZ, Great Britain.

And don't forget to tell Mr Pryer that you heard about the appeal from Colin Baker, via *Voyager*.

Over to you

Attention all SF and space clubs, this is your chance to be in *Space Voyager*. From the next issue we're setting aside space for news of what you've been doing and what you're planning.

What we're looking for are short news items (such as club reports you see in your local newspapers) from all the hundreds of clubs out there. You'll be able to tell other fans your news, enlist their support for campaigns and generally keep in touch with all the diversity.

How to get an entry on the page? Simple, either send in a short report, with all details such as names written VERY clearly or a copy of your club newsletter and we'll do the rest.

Follow the guidelines for submissions elsewhere in this issue and supply a phone number so that details can be checked if necessary.

Satellites save lives

A new emergency signalling system that relies on satellites had saved 233 lives by this summer, it has been announced. The international project, of which Britain is a participant, relies at the moment on one American and two Soviet satellites circling the globe listening for 'mayday' messages.

Once a signal has been received – most are from boats or crashed aircraft in remote places – the satellites can pinpoint its source to within a few kilometres and alert emergency services. Before the system began in September 1982 it was not possible to locate people in trouble with the same accuracy, if at all.

Charities

The Triple C *Star Trek* convention committee has donated £125 to Kidney Research and £75 to the St John's Ambulance Brigade. This £75 was to have gone to the Buster Keaton Memorial Fund but enquiries both in Britain and the States failed to track down a fund address.

The UFP Committee has passed on £950 to Muscular Dystrophy research. That this *Trek* convention committee could donate so much is due mainly to guest David Gerrold waiving a fee and accepting only expenses for his visit.

Winner

There were lots of entries for the Scrambled Satellites Competition in Issue 10 of *Space Voyager*.

Answers are:

Mercury	(no satellites)
Venus	(no satellites)
Earth	Moon
Mars	Phobos, Deimos
Jupiter	Amalthea, Io, Europa, Ganymede, Callisto, Leda, Himalia, Lysithea, Elara, Ananke, Carme, Pasiphae, Sinope
Saturn	Mimas, Enceladus, Tethys, Dione, Rhea, Titan, Hyperion, Iapetus, Phoebe
Uranus	Miranda, Ariel, Umbriel, Titania, Oberon
Neptune	Triton, Nereid
Pluto	Charon

First out of the editorial hat and winner is Thomas McAteer, of Coleman Crescent, Ramsgate, Kent. So Thomas, your copy of Duncan Lunan's Man and the Planets is on its way to you at whatever warp speed the Post Office can manage!

Thomas wanted to take a diary with him, so that he could list the planet's beauty spots so that future visitors would have a guide.

British satellite success

A British satellite launched on 16 August is now soaring up to 100 000 km out in space as part of the international 'Ampte' project to discover how the Sun's radiation leaks into the Earth's magnetic envelope. The UKS satellite was born aloft a week late from Cape Canaveral in Florida with two US and German satellites to head out into the 'magnetosphere'. The American probe was left behind in a low orbit as planned, while the European partners travelled high up to the outer edge of the magnetic field to begin experiments.

Some time in September, when scientists decide the time is right, a canister of lithium

Con Data
by Chris Chivers

Nov 3 BIRMINGHAM COMIC MART. Methodist Central Hall (Opp Law Court) Corporation Street, Birmingham. Mart only. Afternoon. Entry Free.

Nov 9-11 NOVACON 14. SF Birmingham. Guest Robert Holdstock. Write: 11 Fox Green Crescent, Acocks Green, Birmingham 27.

Nov 16-18 FOURTH LEONARD NIMOY CON. Nottingham. Write: Carol Davies, 77 The Ridings, Ealing, London W5 3DP.

Nov 16-18 SPACE '84 Space fact Convention. Brighton. Write: British Interplanetary Society, 27-29 South Lambeth Road, London SW8 1SZ.

Dec 8 COMIC MART As Nov 3.

Dec 14-16 SANTACON. Multimedia. Leeds. Write: 84 Ambrose Street, Fulford Road, York YO1 4DR.

1985

March 22-24 DENTON CONVENTION. Media. Birmingham. Guests – Richard O'Brien and Jonathan Adams. Write: 16 Tonbridge Road, West Molesey, Surrey KT8 0EL.

March 23-24 RISING SUNS. Manchester. Write: Eric Letherman, 196 Woodlands Road, Cheetham Hill, Manchester M8 7QH.

April 5-6 YORCON 3. SF. Leeds. Guests – Gregory Benford, Linda Pickersgill. Write: Mike Ford, 45 Harold Mount, Leeds LS6 1PW or Mary Burns, 23 Kensington Court, Hempstead, New York, NY, USA 11550.

May 3-6 SOL 3 85. Trek. Liverpool. Write 39 Dersingham Avenue, Manor Park, London E12 5QF.

Aug 3-4 LEISURE LIVE 2. Dr Who. Swindon. Write: Tony Cherrington, 2 Domestic Quarters, Bryanston School, Blandford, Dorset DT11 0PX (Do not phone).

Aug 23-26 ENTERPRISE 1. Trek. Liverpool. Write Sharon Rowe, 24 Haywards Close, Clevedon, Avon

(Readers should always enclose an SAE or IRC when contacting con organisers for details, please).

Space Voyager is hoping to compile and maintain a record of all SF cons round the world, for the benefit of all our readers. We may not publish details of every one, simply because there isn't space, but readers with travel plans will be able to find out about any cons and make arrangements to attend while abroad.

Readers – and especially con organisers from out of Britain – can get into the diary by sending details to Chris Chivers at the Hemel Hempstead address.

DATA BANK

will be ejected from the German satellite and deliberately exploded to expose a cloud of the element to the Sun's radiation. This 'solar wind' will push the charged atoms into the Earth's magnetic field to be detected by the other two craft. In this way, scientists hope to discover exactly how natural particles behave near the Earth.

Dr Alan Gabriel of the Rutherford Appleton Laboratory in Oxfordshire, which built UKS along with University College, London in a record three years, tells us that the results will also probably help research into nuclear fusion. Eventually, fusion reactors should provide mankind with inexhaustable clean energy.

In December an even more spectacular experiment is planned: the creation of an artificial comet. High over the Pacific Ocean – so it will be invisible from Britain – a canister of barium will explode outside the Earth's magnetic field and the solar wind should force it into a shape like that of a comet. More releases are planned for March/April to create artificial auroras over the poles for a few minutes.

British scientists are delighted with the project because, although we are paying only £5 million towards the total cost of £65 million, we will share equally in the results.

Brazil to launch own satellites

When two Canadian-built comsats are launched on the US Space Shuttle in February and August next year, their Brazilian owners will be watching with keen interest. For, although they are presently paying more technically advanced space nations to orbit satellites for them, the Brazilians intend to build their own satellites in a few years and launch them with home-produced rockets.

Part of the contract with Spar Aerospace of Canada allowed Brazilian technicians and engineers to study closely the work involved in building and operating satellites. By 1989 the first satellite built in Brazil's own Institute for Space Research should be ready to go aloft aboard a rocket produced by their Air Force. A second 115 kg satellite for collecting environmental data (rainfall, temperature, pressure, riverwater levels) will fly into space the following year.

Since Brazil is such a huge, underdeveloped country with vast natural resources, it makes sense to study it in detail from space. These two environmental craft will be followed by two 170 kg remote sensing satellites with cameras that will reveal mineral deposits, agricultural trends etc, just as the American Landsat 5 does now. India has similar plans, somewhat more advanced since they have already launched satellites with indigenous rockets.

The camera will be tested first aboard the Space Shuttle in 1987, flying with a Brazilian astronaut.

Home-grown spaceship

If you want to help a home-built rocket make it into space then all you have to do is donate $1,000,000 to retired rocket engineer Robert Truax in California. That's the sum the 66-year-old needs to complete the work on his 10 m long, 64 cm diameter rocket to get it off the launch pad over the next 18 months.

The retired US Navy captain, closely involved with the Polaris missile in earlier days, began building his 2000 kg thrust rocket several years ago in his backyard using his engineering know-how and government surplus missile components. The four main engines were found in a junk yard, left over from their work as guidance motors on Atlas missiles. In July he succeeded in firing the rocket in a 30 s static test. In a real flight, it would carry a passenger – as small as possible to fit in the cramped nosecone – up to 80 km high in order to qualify for the 'astronaut' rating. Fell Peters would thus make a similar flight to NASA's Alan Shepard's historic 'flea hop' of 5 May 1961.

This would not be the first time that Truax's handiwork had carried a passenger – he built Evel Knievel's steam-powered Skycycle when the daredevil attempted (and failed) to leap the Snake River Canyon in the US.

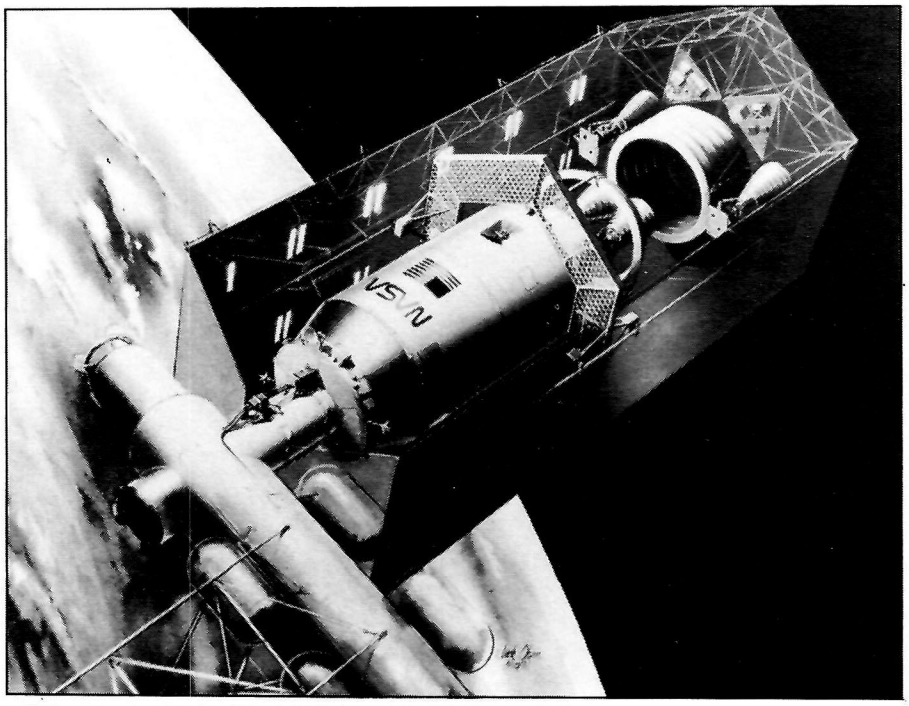
Chinese DBS

British Aerospace is working with French firm MATRA on a direct broadcast satellite for China.

Inscrutable spacefarers

Japan is planning a new rocket that will allow them to compete with the major space nations in launching heavy satellites into distant orbits. At the moment, their Mu and N rockets can handle only small satellites but the newly-approved H2 will be ready to take 1500 kg into geostationary orbit (36 000 km high) by 1991. This will be in direct competition with the European Ariane and US Delta rockets but the charges to users remain to be seen – even if the Japanese do decide to market their product commercially.

The 46 m high H2 will use liquid/oxygen engines on the first two stages, illustrating just how advanced it will be. Until recently, only the US and Ariane used these tricky supercold propellants, with the USSR and China now joining the club.



NASA has recently awarded 2 study contracts to Boeing and Martin-Marrietta to investigate the OTV: the Orbital Transfer Vehicle. The Shuttle can reach only low Earth orbits and large payloads that need to travel further out require extra boost stages. The version of the OTV shown in the artist's impression would be housed permanently at the Space Station in a protective hangar, where it would be serviced between sorties. The payloads would come up on the Shuttle (perhaps in sections if they were very large), be attached to the OTV and then make the journey out to their final destinations. The OTV would undock and return to the station for refurbishment and to wait for another payload. The transfer vehicle will be an important step after the Space Station to returning permanently to the Moon since it could be used to transport equipment to build bases circling our nearest celestial neighbour and, eventually, down on the surface. Future versions could even be manned to ferry crews around the higher orbits.

ESA NEWS

Weather satellite on offer

Want to buy a satellite? If so, then apply in writing to the European Space Agency and enclose a cheque for $60 million . . .

ESA is offering to sell the Japanese a Meteosat weather satellite – of the type that now brings weather views to our TV screens every night – plus a launch aboard an ESA Ariane rocket in 1989. Japan has not had much luck with its Metsats – the last two, built by an American company have both failed in orbit, leaving that area of the Pacific with poor coverage.

In that light, the offer must be very tempting

NASA Medal

ESA's Director General and Director of Space Transportation Systems both received NASA Distinguished Publish service Medals this summer. The awards, to Mr Erik Quistgaard and Mr Michel Bignier, are the highest which can go to non-NASA staff.

European satellite underway

Work has now started on building Europe's important contribution to Earth observations. The European Remote Sensing satellite, or ERS-1, is being built in Germany for a launch in April 1989, with 14% of the work coming to Britain.

The satellite will observe the Earth's oceans, ice zones and coastal areas with its radar and other instruments. The oceans have been largely neglected by Earth-observing satellites so far but they are of vital importance to our climate and food supplies in the long term. Understanding them better could lead to new food sources opening up in the future.

What's in a name

Little did the Italian poet Dante realise that when he wrote of Ulysses exporing 'an uninhabited world behind the Sun' that one day a spacecraft bearing that name would observe our star from a unique vantage point. The European 'International Solar Polar Mission' will be launched by the Space Shuttle in May 1986 and the European Space Agency has now renamed it 'Ulysses' to give it more dramatic impact. Space projects usually start off with a rather boring title then switch to something more impressive. For example, everyone has heard of the Galileo probe to Jupiter but few will recognise it by its original name of 'Jupiter Orbiter Probe'.

Paradoxically, although Ulysses is designed to observe the Sun, it will head for Jupiter almost at the same time as Galileo. It will fly past that giant planet in mid-1987 and use the strong gravitational field to swing out over the 'ecliptic' plane and back towards the Sun. The planets orbit the Sun in the ecliptic plane but, for the first time, a spacecraft will break free and travel over the Sun's north and south poles to observe it and the space around it. The data should allow scientists to build the first 3D model of the Solar System, with the radiation, magnetic fields and dust particles mapped out.

Europe's Spacefarers

While some observers have sarcastically pointed out that the numbers hardly make it worthwhile, seven of Europe's space travellers have formed 'The Association for European Astronauts'. The professional association has the aim of pooling the astronauts' knowledge and promoting their standing in the space science community.

Most of the members have yet to fly in space: Wubbo Ockels (Holland, Spacelab mission in 1985), Patrick Baudry (France, Shuttle, March 1985), Claude Nicollier (Switzerland, Shuttle, November 1985), Reinhard Furrer and Ernst Messerschmidt (W German Spacelab astronauts). Only Ulf Merbold and Jean-Loup Chretien have actually been into orbit, the latter aboard the Salyut 7 space station with Soviet cosmonauts in 1982.

The association is due to hold a meeting in September and will possibly discuss France's proposed Hermes mini-shuttle and Europe's Columbus space station. There has been no news of Britain's four astronauts-in-training being invited to join the group.

British astronauts in training

Four British astronauts – Commander Peter Longhurst, Major Richard Farrimond, Squadron Leader Nigel Wood and civilian Christopher Holmes – are now well into their training to fly aboard the Space Shuttle in two missions during 1985/86. Two of the four will fly individually with the Skynet 4A and 4B military communications satellites as representatives of the Ministry of Defence.

The United Kingdom, once with a vigorous satellite launcher programme of its own, will thus be well down the list of countries to fly astronauts in space. Nations such as France, Cuba and Hungary have flown with the Soviets to the Salyut 6 and 7 space stations but Britain hesitated even when NASA offered a place with each Skynet.

NASA policy is now to make a Shuttle seat available whenever a major payload – most of which will be communications satellites – is carried by the spaceplane. Two Canadians will fly but Australia turned down the offer with its US-built Aussat satellites.

Whoever travels with the Skynets will be responsible for checking them out before NASA's own astronauts release them into orbit. Chris Holmes, a civilian Ministry of Defence employee, is Skynet's project manager and Naval Cdr Longhurst has long been connected with the satellites. Major Farrimond is with the Army's Royal Signals – with a degree in telecommunications engineering – and the RAF representative, Nigel Wood, is a test pilot.

A Skynet expert is not strictly necessary – NASA crewmen have coped perfectly well with several satellites so far – but it is all part of the space agency's effort to attract customers away from other launchers, such as Europe's Ariane rocket.

At first it was said that no Briton would fly at all but then Cdr Longhurst was named before the others were included. By mid-summer it was rumoured that Lt Col Tony Boyle of the Royal Signals would be chosen to make the first trip but he was then exchanged for Major Farrimond because he was required back in Britain to work on a sensitive security case.

The satellites will provide vital communications links for up to seven years each around the world. The Falklands campaign forced British forces to use US satellites to maintain links the length of the Atlantic, a situation that military chiefs would not like to see again.

NASA NEWS

Staying in touch

While the latest batch of NASA astronauts struggle to learn the intricacies of the Space Shuttle, four more men will be learning about living and working in space. Two engineers from the Hughes Communications company in the US will each fly with two Leasat Syncom IV comsats built by their company and leased – hence the name – to the US Navy for keeping in contact with ships at sea.

Gregory Jarvis and Dr John Konrad are both closely involved with designing and building comsats so it is only natural that they should go up into space to make sure their 'birds' fly properly. They and backups William Butterworth and Dr Steven Cunningham will train with NASA for 9 months before they can be deemed ready to leave the ground. In the past, if anything went wrong in space the astronauts had to be put in touch with experts on the ground. Now the experts will be up there as part of the team.

They will not be the first company men in orbit. Charles Walker of McDonnell Douglas flew on Shuttle mission 41D with an experiment designed to produce purer drugs.

Selling the Shuttle

NASA Administrator James Beggs has said that he hopes the four Space Shuttles will be sold off to a private operator at the end of this decade. NASA is not a commercial operation – its job is to develop new systems – and he hopes that the cost of running it will equal the money coming in from paying satellite customers by 1990.

There has long been interest from companies in sponsoring a fifth Shuttle. One proposed to fund the $1,500 million and have the right in return to act as 'agent' for the entire fleet. A fifth Orbiter is not really needed now to cope with the number of satellites being launched, but if one of the others is lost in an accident it would take years to replace.

An interesting problem with a new Shuttle would be in choosing a name. How about *Space Voyager*, NASA?

Space Telescope

The world's largest space telescope, now renamed the Hubble Space Telescope after the famous astronomer, is now back on course for a launch into orbit aboard the Space Shuttle in August 1986.

The telescope, with a main reflecting mirror 2.4 m across, will be able to see some seven times deeper into the Universe than anything we have built on the ground. This is because it will work from above the atmosphere, away from the dirt and pollution that affects starlight.

The $1000 million project was in trouble last year because several sections of it were not up to specification. Since the telescope will float around in orbit, it has to be able to 'lock' onto stars steadily in order to observe them – a requirement that was proving difficult to satisfy. The Shuttle will be able to bring the telescope back to Earth occasionally for repair and modification. Solar panels were built by British Aerospace and Europe as a whole contributed 15% of the total cost.

Whoops!

The £21 million Intelsat 5 communications satellite, launched by an Atlas/Centaur rocket has probably been lost for good.

The initial Atlas stage of the launch went perfectly but after the first firing of the Centaur during a coasting period the Centaur and Intelsat began tumbling. Plus, on its second firing the Centaur engine did not burn for as long as it should have.

Intelsat 5 was owned by a 108 nation consortium and should have carried 12 000 telephone lines and two TV channels. It is the fourth time in 15 months that a communications satellite launched by NASA has failed to achieve its proper orbit.

Fire in space

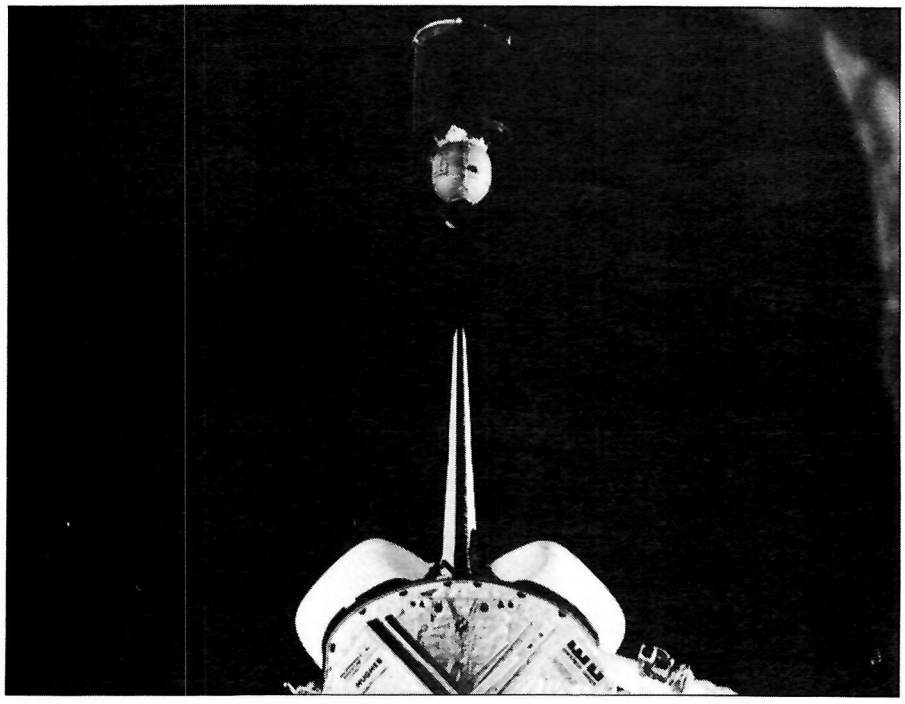
NASA has announced that it will sponsor a $1.5 million experiment aboard the Space Shuttle in 1986 to study how materials burn in weightlessness. No astronaut has ever died during a fire in space but it can only be a matter of time before the dreaded word 'Fire' is shouted down a communications link to Earth.

No-one knows how fires would behave in space, so it is difficult to protect against them. Professor Robert Altenkirch of the University of Kentucky plans to set fire to a piece of filter paper and a chunk of Plexiglass in a sealed container and film how they burn for a few minutes.

The Space Shuttle presently carries its own system of smoke detectors and fire extinguishers. Fixed bottles of Freon gas are positioned for blazes where astronauts cannot reach and there are always small extinguishers on hand. The main control panel even has holes in it so that extinguisher nozzles can be poked through to get at fires behind the instruments.

New Exhibit

The newest acquisition of the National Air and Space Museum is just that bit tricky to see, if you should ever call in. It is 400 million miles away on Mars and it's the Viking Lander 1, which has been there since 1976.



Buck Rogers Rides Again

The flight of Shuttle 51A in November promises to be even more exciting than that of 41C last April when the ailing Solar Max satellite was captured and repaired. Astronauts Joe Allen and Dale Gardner have been training all summer to rescue the Palapa and Westar communications satellites that were lost when the upper stages failed in February, leaving the $35 million craft in the wrong orbits.

By early November, the satellites will have been brought down low enough for the Shuttle to reach them, and their 50 rpm spin rates reduced to 6 rpm for safety. In each case, one of the astronauts will strap on his Manned Manoeuvring Unit to jet over and insert a long pole inside the nozzle of the satellite's own spent booster.

The satellites will be brought into Discovery's cargo bay and locked into position for the return to Earth. If they are in good enough condition they will be repaired and sent aloft to try again to reach geostationary orbit 36,000 km high.

It all sounds quite simple but the satellites were never designed for retrieval and grabbing them could be dangerous. Their losses last February were widely reported as failures on NASA's part even though the failed upper stages were not the space agency's. A successful rescue will show just how versatile the reusable spaceplane is.

It's the real thing . . .

It gets everywhere. Now Coca Cola, makers of that famous drink, have set their sights on space. The US company have asked NASA for the franchise on the Shuttle and any future orbiting Space Stations. But that raises an interesting problem: how would they get the bubbles that make it fizzy to stay in the drink with the low cabin pressures of the spacecraft? Extensive research is clearly necessary.

Perhaps NASA will soon start slapping advertising stickers all over their Shuttles to help defray the astronomical cost of each flight.

Space smuggling?

Shuttle astronauts will be able to walk with confidence through the 'green Channel' when they get back to Earth in future. A proposed 'Tax Status in Space' act says that as long as the goods come from a US spacecraft they can be treated as though manufactured in America.

SOVIET NEWS

Soviet summer success

From a Soviet point of view, the major space story this summer was the first spacewalk by a woman cosmonaut: Svetlana Savitskaya. Following the departure of the Soviet/Indian crew in April, western experts expected a new woman flyer to go aloft and possibly make a spacewalk while visiting cosmonauts Leonitd Kizim, Vladimir Solovyov and Dr Oleg Atkov aboard the Salyut 7 space station.

It was a surprise to everyone when Savitskaya, who first flew in August 1982 aboard Soyuz T-7, travelled up to Salyut with Vladimir Dzhanibekov and Igor Volk aboard Soyuz T-12 on 17 July. With hindsight, perhaps it was not so much of a shock. US astronaut Sally Ride was due shortly to become the first woman to make two space trips and Kathryn Sullivan was to have made the first female EVA – so what could be more tempting to send up Savitskaya again and send her out on a spacewalk?

Whatever the motives, she was warmly welcomed with flowers by the three space voyagers who had been aboard their cramped quarters since 9 February aiming to break the 221 day space endurance record on 5 September.

The six-person team got down to work and began a series of medical tests and the usual set of Earth observations. Dr Atkov concentrated on Igor Volk – new to space – in an effort to understand how the human body responds to living in weightlessness. Along with American astronaut-doctors, the Soviets are trying to combat space sickness and see if people can stay in space indefinitely. The 'Tavria' experiment was used for electrophoresis work to produce samples of a new, purer flu vaccine.

This 'routine' scientific work occupied them for several days but on 25 July Savitskaya and Dzhanibekov donned their spacesuits and stepped outside Salyut to greet the Earth 350 km below. This was where their underwater training and flights in zero-g aircraft began to pay off. The main task of the 3 h 35 m EVA was for Savitskaya to test a new 30 kg space tool that can weld, cut and solder metal with an electron beam.

As she worked away, fighting against the stiffness of her suit, Dzhanibekov sent pictures of her down to mission control with a TV camera. She joked and talked normally throughout the job and eventually the celestial pair took a 40 minutes rest as Salyut slipped into the Earth's shadow. They swapped jobs and then finally took the completed samples back into Salyut for eventual return to Earth and detailed analysis. Hopefully, the tests will have shown that such close work can be carried out in space and that it produces welds of better quality than here on Earth.

Congratulations were the order of the day as the two tired walkers sloughed their space skins and cosmonaut Alexei Leonov – the first ever spacewalker – called it 'an important new step'. All three of the new crew were awarded the Order of Lenin, the highest Soviet honour, and it was ordered that a bronze bust Savitskaya should be erected at her birthplace.

Four days later, Soyuz T-12 softlanded 160 km north east of Dzhezkazgan, bringing the experimental results and exposed film cassettes with it. The usual 8 days of a visiting Salyut crew had been stretched to 12 – no doubt welcome to Kizim, Solovyov and Atkov as they pressed on to the six month mark. Left alone, they settled back into their routine but they did take 20 July as a holiday, for example, and talked to their relatives via a TV link.

They were not idle for long. On 8 August, Kizim and Solovyov ventured outside to continue the repairs to their leaky main engine. The T-12 crew had brought up video-taped instructions on the eight hour EVA.

Another Progress supply craft joined up with Salyut on 16 August, further evidence that the endurance record was a target.

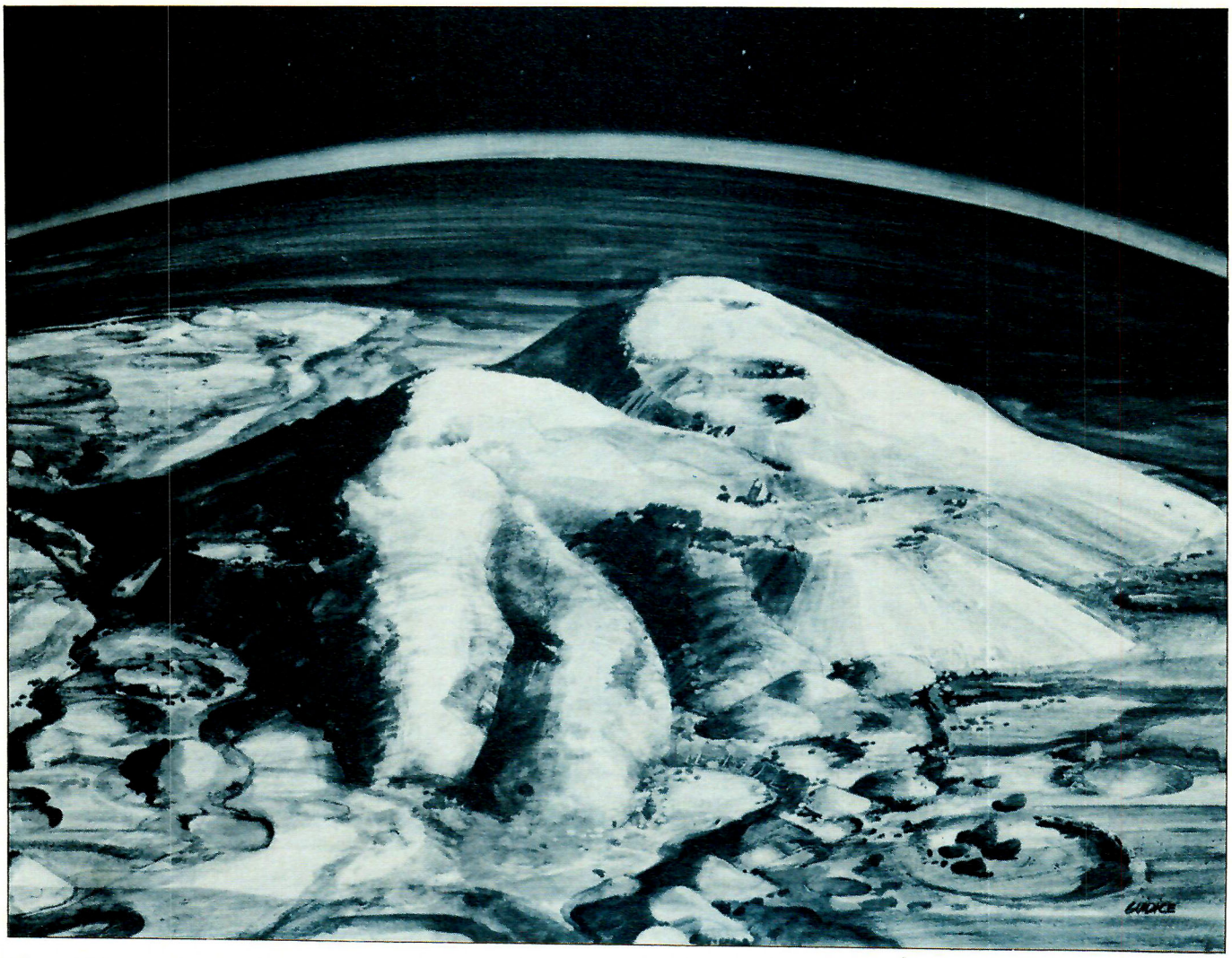
Future missions are hard to predict but we can expect unmanned Progress ships to make the trip up from central Asia to take new supplies. The crew particularly welcome packages of letters and books from friends and relatives. We might get a large 'Star' module attaching itself to Salyut as Kosmos 1443 did once before to double the size of the orbital complex. Perhaps we will see a two-woman crew with the long-awaited new female. We can expect a new long-stay three-man crew to go up in the autumn and take over directly from the present occupants – previously the station has been left empty while a new crew prepared on the ground.

Elsewhere on the Soviet space scene, it is believed that engineers are preparing for the launch shortly of a new large rocket. An even larger vehicle is expected to make its debut next year, large enough to carry sections of a permanent space station into orbit. More tests of a small Soviet shuttle might be seen.

As of early July, the Soviet satellite launch rate was 15% up on last year, with 56 flights – most of them military – in contrast to the American's 10 over the same period.

VOLCANOES OF VENUS

IN TIMES PAST VENUS WAS REVERED FOR HER BEAUTY AND MYSTERY AS THE MORNING AND EVENING STAR. BUT SLOWLY, EVER SO SLOWLY, MAN IS FINDING OUT ABOUT OUR CLOSE NEIGHBOUR IN THE SOLAR SYSTEM. PATRICK MOORE TAKES US ON A TOUR OF SCIENCE FICTION'S SECOND-FAVOURITE HOME FOR ALIENS



All through this winter, the planet Venus will be a magnificent spectacle in the western sky after sunset.

It is far brighter than any other object in the sky apart from the Sun and the Moon; it may sometimes become brilliant enough to cast definite shadows, and it is not in the least surprising to find that the ancients named it in honour of the Goddess of Beauty.

Yet appearances can be deceptive. Instead of being a warm, welcoming world, as used to be thought, Venus has proved to be almost incredibly hostile.

First, a few basic facts. Venus has a diameter of 7520 miles, and is therefore rather smaller than the Earth. Its mass is 81 per cent that of the Earth, and its escape velocity is $6\frac{1}{2}$ miles per second, as against our 7 miles per second.

This means that the surface gravity is 90 per cent that of our own; if you could go to Venus you would feel very slightly lighter than at home.

The mean distance from the Sun is 67 million miles (as against 93 million miles for the earth), and this varies very little, because the orbit of Venus is almost perfectly circular. The revolution period, or Cytherean 'year', is 224.7 Earth days. (Note that there is no universally accepted adjective for Venus. Venusian, Venerian and other forms have been used. I prefer Cytherean, coming from an old name for Venus, even though it may not be strictly correct!)

Before the Space Age, Venus was widely nicknamed 'the planet of mystery', because even though it is capable of coming closer to us than any other planet – even Mars – we knew almost nothing about it.

Telescopically, all that can usually be seen is the characteristic phase, sometimes with very vague dusky or brighter patches. We can never see the solid surface of Venus. Unlike Mars, Mercury or the Moon, Venus is hidden by a dense, cloudy atmosphere which never clears, so that the markings are elusive and impermanent, changing from day to day or even from hour to hour. Before the coming of the space-probes, our ignorance of the surface conditions was complete.

The early theories

Of course, there were many theories. Svante Arrhenius, a Swedish scientist of 80 years ago whose work was good enough to win him a Nobel Prize, believed that Venus could be a world in a state very similar to that of the Earth over 200 million years ago, when the Coal Forests were being laid down and even the dinosaurs had yet to make their entrance.

To Arrhenius, everything on Venus was dripping wet; there was luxuriant primitive vegetation, in which flew giant dragonflies and other insects, while the highest forms of life on the planet were huge amphibians. The atmosphere was made up largely of the heavy gas carbon dioxide – and this was indeed found to be true.

Alternatively, it was suggested that there might be no water at all. Carbon dioxide tends to act in the manner of a greenhouse, shutting in the Sun's heat; and since Venus is more than 20 million miles closer to the Sun than we are, a high temperature was only to be expected.

Then, as recently as the late 1950s and early 1960s, came a theory supported by two famous American astronomers, D H Menzel and F L Whipple, who believed Venus to be covered almost entirely with water, with only a few islands protruding here and there. This would lead to a bizarre situation, because the water would have been fouled by the carbon dioxide in the atmosphere, resulting in seas of soda water (though nobody went so far as to believe in the presence of any whisky to mix with it).

If this marine theory had been correct, it would have led to a fascinating speculation. Life on Earth began in the warm seas; if there were similar oceans on Venus, life might have appeared there too, and might presumably evolve.

But everything was very uncertain; even the length of the rotation period or Cytherean 'day' was not known, and most astronomers believed it to be about a month long. There was also the problem of the so-called Ashen Light.

When our Moon is a crescent, the unlit half can often be seen shining faintly, because of light reflected on to it from the Earth. Telescopically the same sort of thing can be seen with Venus; it is very elusive, but most serious observers have observed it (I have, on many occasions).

Electoral celebrations!

Venus has no moon, and so the cause of this Ashen Light must be sought elsewhere. Franz von Paula Gruithuisen, a last-century German astronomer with a lively imagination, believed it to be due to artificial illuminations, provided by the local inhabitants to celebrate the election of a new Government.

However, most people preferred to attribute it to magnetic or electrical effects in the Cytherean upper atmosphere, perhaps of the same type as our polar lights or aurorae.

The first breakthrough in our studies of Venus came in December, 1962. Mariner 2, the first successful interplanetary space-craft, flew past the planet at a distance of only about 21 000 miles, and sent back information from close range. It found that the surface temperature was very high – so high, in fact, that water could not possibly exist, and the attractive Whipple-Menzel marine theory had to be abandoned at once.

The atmosphere was indeed made up chiefly of carbon dioxide, and the rotation period was unexpectedly slow. Later work, partly from Earth-based radar, revealed a very curious state of affairs. Venus takes 243 Earth-days to spin round – and this is longer than the Cytherean year. Moreover, Venus spins from east to west, not west to east in the same sense as the Earth; and to complete the picture, the upper clouds have a rotation period of only four days, so that the atmospheric structure must be very unusual indeed.

Why does Venus spin in this peculiar way? We have to admit that we do not know. Though we have solved at least some of the mysteries of this remarkable planet, we are very far from knowing the whole story.

Marine 2 was followed by other probes to Venus, both American and Russian. The Soviet scientists set out to soft-land vehicles on the surface, parachuting them down through the clouds, and they succeeded after several attempts; in October 1975 Veneras 9 and 10 came down and were able to transmit one picture each before being put out of action by the ferociously hostile environment.

The scene was of a gloomy, rock-strewn landscape, as stark and forbidding as could possibly be imagined. It was not dark, but, as the Russians wrote, the illumination was no greater than that in Moscow on a cloudy winter day. The winds were sluggish, amounting to a few knots, though in that thick atmosphere they had tremendous force. And, of course, the Sun, the Earth and the Stars were permanently hidden.

Temperature over 900 F

Since then the Russians have soft-landed other probes, and have confirmed their earlier results. One interesting fact is that the sky is orange. The surface rocks are red, and at a temperature of over 900 degrees Fahrenheit. The cloud-deck ends well above the actual surface, and it has been said that the lowest layers of the atmosphere may be likened to corrosive, intensely hot 'smog'.

What about the clouds themselves? Lovely though they may look from Earth, they are in fact deadly, because they contain large quantities of sulphuric acid. There may well be sulphuric acid 'rain', though probably it evaporates before reaching ground level. And the atmospheric pressure on the planet's surface is over 90 times that of our own air at sea-level.

I have often said that anyone who goes to Venus and steps outside his space-craft will promptly be fried, poisoned, squashed and corroded! We have come a long way from Svante Arrhenius' vision of a tropical forest with its dragonflies.

The next step was to survey the surface, and try to find out what it was like. We can never hope to see it directly, but there is another method: radar, which involves sending out a pulse of energy, bouncing it off some solid body (or equivalent), and studying the returned 'echo'.

I have compared this, admittedly very inaccurately, with what happens when you throw a tennis-ball against a wall and catch it on its return. The way in which the ball comes back gives at least some idea of the state of the wall.

Earth-based radar proved to be very useful, and there have been other investigations too; for instance, David Allen, at the Siding Spring Observatory in Australia, has recently taken infra-red pictures of the dark hemisphere of Venus, revealing clouds which seem to be well below the brilliant clouds seen in ordinary light. But all in all, we owe most of our knowledge to the radar-equipped probes which have been put into closed paths round Venus.

America's Pioneer is still in operation; so too is the latest Russian Venera. Between them, they have revealed a picture which has been very much of a surprise.

Rising from Venus's great plains, about 30degrees north of the equator is Beta Regio, apparently two huge shield Volcanoes. Beta Regio is seen here in an artist's impression derived from topography measurements taken by the Pioneer Venus Orbiter. The two mountains, about 13,000 feet above the plains have been tentatively named Thea Mon and Theia Mons. The two are on a huge fault line running roughly north-south which appears to have other volcanoes on it. Russian Veneras 9 and 10 landed directly east of Beta and found the rocks there to be basalt and therefore volcanic in origin. Photo: NASA.

Ishtar and Aphrodite

First, there is a huge, rolling plain which covers at least 60 per cent of the total surface. There are two main highland areas, which have been named Ishtar and Aphrodite. Ishtar, in the north, has a diameter of over 1800 miles; its western part (Lakshmi Planum) is a smooth plateau well over a mile and a half above the general surface level. At the eastern end of Ishtar there are the Maxwell Mountains, which rise to almost seven miles and are the highest peaks so far found on Venus (it is not likely that there are any which are loftier, because we have now been able to survey almost the whole of the planet's surface).

Aphrodite, near the Cytherean equator, is larger than Ishtar; it is 6000 miles long and almost 2000 broad at its widest point. At one end is Diana Chasma, a huge rift valley.

A smaller but more significant upland area is known as Beta Regio. Apparently it consists of two large shield volcanoes, Rhea Mons and Theia Mons, each of which is about two and a half miles high. This makes them comparable with the Hawaiian volcanoes of Mauna Loa and Mauna Kea, and they do in fact seem to be of exactly the same type. What makes them so interesting is the revelation that they are almost certainly active.

The Russian investigations, and also some of the American, have indicated that there is almost continuous lightning activity over them, and this at once is a sign of vulcanism. Rhea and Theia are not unique. At one end of the Aphrodite upland there is a region known as Atla; here too there is lightning, and presumably volcanic activity.

Additional evidence comes from measurements of sulphur dioxide gas in the Cytherean atmosphere. Evidently the amount of it increased suddenly in 1978, since when the level has been dropping again, this has been interpreted as being due to a tremendous volcanic outburst, far more violent than the Krakatoa outbreak of 1883. According to Dr Larry Esposito, of Colorado University: 'The natural explanation is to assume that sulphur dioxide came up from the surface and then dropped in the form of acid rain indicating a volcanic eruption shortly before then.'

Though Theia and Rhea are similar to our Hawaiian volcanoes, the general situation is different. The Earth's surface is divided into several major 'plates', on which the continents drift very slowly around; volanic activity occurs near the plate boundaries – as in Hawaii. Of the two main volcanoes there, Mauna Loa is active, while Mauna Kea is extinct, and one of the world's greatest observatories has been built on its summit at a height of nearly 14 000 feet.

A volcano lies above a 'hot spot' or plume deep down in the Earth's mantle. Mauna Kea used to lie directly above this plume, and was active; now it has moved away, to be replaced by Mauna Loa. Eventually Mauna Loa also will drift away from the plume, and its activity will cease.

Venus has a thicker crust than the Earth, and is apparently a one-plate planet, so that there is no drifting around; a volcano above a plume will stay there indefinitely, and this seems to be the case with Rhea and Theia as well as Atla. On the other hand the Maxwell Mountains, which are decidedly higher, show no signs of activity, and are thought to be extinct.

Even more hostile

If these ideas are right – and all the evidence points that way – then Venus is even more hostile than has been believed. In addition to the temperature, the pressure and the corrosive acid, there are also tremendous volcanic outbreaks. It has even been said that conditions there are very much like those of the conventional picture of hell.

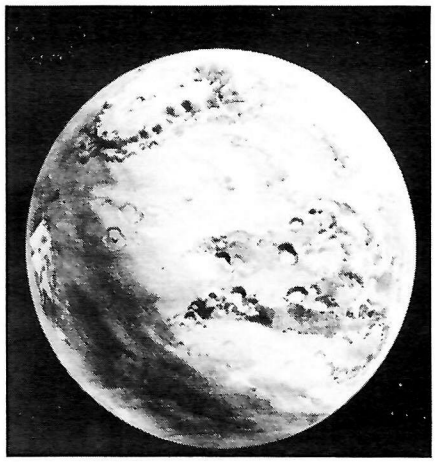
If Venus and the Earth are so similar in size and mass, why are they so different? The root cause must surely be the fact that Venus is closer to the Sun, and by looking back into the early story of the Solar System we can at least make some reasonable speculations.

The Earth and the other planets were born from a 'solar nebula', or cloud of material associated with the youthful Sun, about 4700 million years ago; the Earth's age has been measured with fair certainty, and the same is true of the Moon, since we have now been able to study lunar rocks in our laboratories. At that time, the Sun was much less powerful than it is now, and seems to have had only about 70 per cent of its present luminosity.

There is no reason to doubt that Venus and the Earth began to evolve along similar lines. The Earth lost its original atmosphere, and produced another from its interior; the oceans were formed, and life appeared (rather earlier than used to be thought). The same may have applied to Venus, but as the Sun grew older it began to increase in luminosity, and the results were dramatic.

The Earth was just far enough away to escape the worst of the solar blast, but Venus was not. The temperature rose; the oceans evaporated; the carbonates were driven out of the rocks and entered the atmosphere, producing carbon dioxide. This, as we have seen, acts as a greenhouse, and there was a runaway greenhouse effect, so that in a comparatively short period by astronomical standards Venus had changed into the furnace-like world of today. Any life which might have appeared was ruthlessly snuffed out, and since then Venus has been sterile.

Is this story correct? Very probably. And in this case, it is just possible that when we can analyse rocks from Venus, we may find traces of past life. If it existed, it must have been very primitive; it had no time to develop as it did on Earth. Frankly, I am very doubtful whether any Cytherean 'fossils' will be found, and in any case there is no chance of securing specimens yet awhile. There is no reason to doubt that an unmanned sample-and-return probe will go to Mars within the next decade or two, but Venus is a different proposition.



This artist's impression of the surface of Venus shows the planet's three continental sized highland regions – Aphrodite Terra (foreground) Ishtar Terra (top) and Beta Regio (left) based on Pioneer Orbiter topography measurements. The real surface could never be seen like this because of the thick cloud cover. **Photo: NASA.**

Russian probes due

The next probes to be despatched to Venus will be Russian. They are due to be launched in December, and their main target will be Halley's Comet, with which they will rendezvous in March 1986; but en route they will pass by Venus, using the pull of gravity of that planet to set them on course for the comet – and as they go by, they will, it is hoped, drop 'balloons' into the Cytherean atmosphere, so that these balloons will float around and send back information from different levels. It is a fascinating project, and one can only hope that it will be successful.

The chances of sending a manned expedition to Venus seem to be nil, at least in the foreseeable future. Carl Sagan has suggested that it may one day be possible to 'seed' the Cytherean atmosphere and break up the carbon dioxide, replacing it with free oxygen, so that the temperature would fall, and Venus might become a habitable world. This is certainly not out of the question, but it is completely beyond our powers at the moment.

If we could in fact go to Venus, and come down through the clouds, what would we find? At just over 40 miles above the ground we would enter the clouds, and the visibility would decrease; at 37 miles up the Sun's disk would be hidden, and nothing of it would be seen apart from a brilliant glare behind the diffuse, yellow cloud-layer made up of sulphuric acid particles.

Descending we would pass through clearer layers and thicker clouds, but not until we dropped to about five miles would we start to see the surface, glowing redly in the gloom. Finally, in landing, we would find that visibility is less than two miles. We have come down in what can only be described as an inferno.

Not so very long ago it was still believed that as a potential colony, Venus was more promising than Mars. We know better now; but hostile though it is, Venus is a fascinating world. Before the end of the century we may hope to find out more; and in particular, we want to know the truth about those volcanoes. Are they really active – and was there truly a giant outburst in 1978? Time will tell. But there is one more thought which is worth bearing in mind. Venus has been destroyed, as a life-supporting world, by its closeness to the Sun. If the Earth had been only ten or twenty million miles nearer the Sun than it actually is, it would have suffered the same fate – and you and I would not be here.

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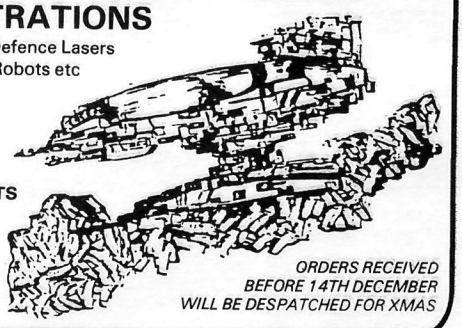

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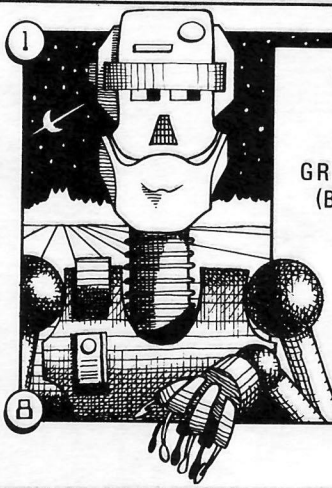

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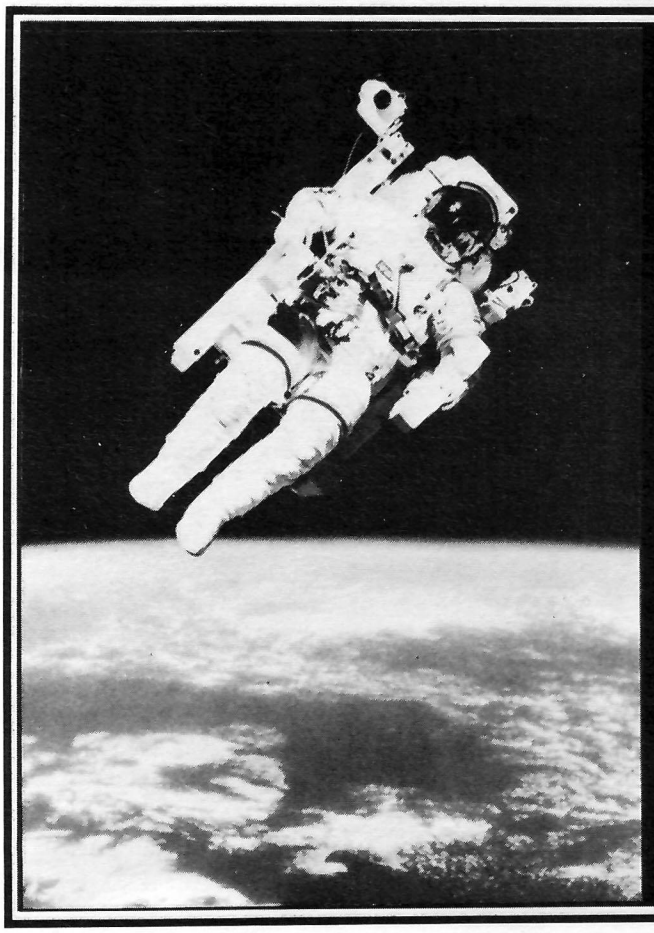

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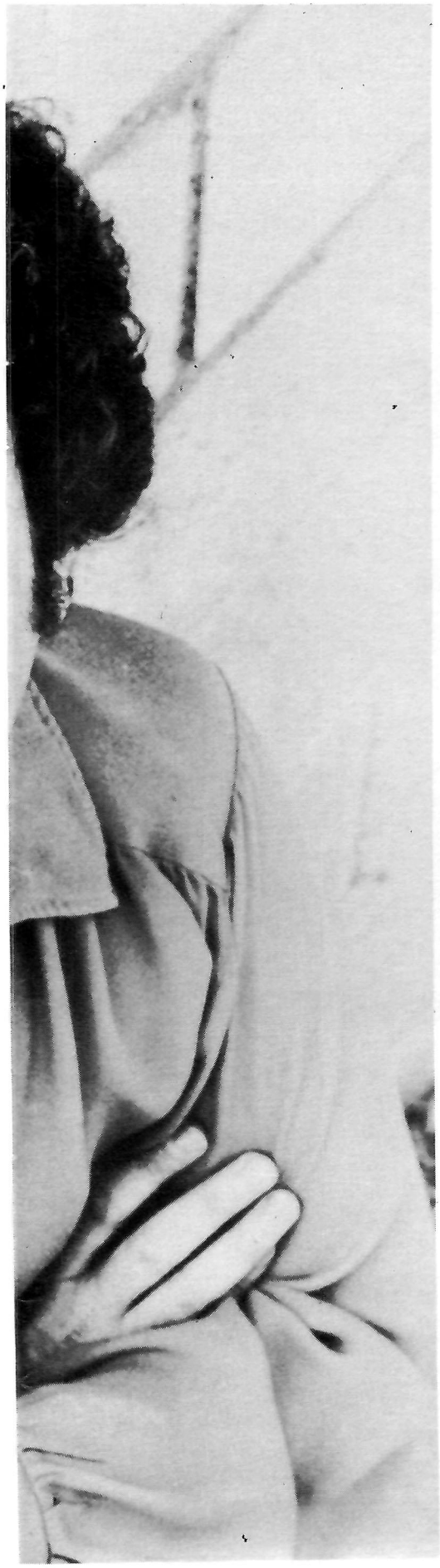


DAVID GERROLD IS A SUB-FANOMENON OF *STAR TREK'S* GALAXY. SINCE HE PENNED *THE TROUBLE WITH TRIBBLES* WAY-BACK-WHEN, DAVID HAS TAKEN TO FANDOM AND IT TO HIM WITH THE GUSTO WHICH COULD ONLY COME TO CONFIRMED TREKKERS. BUT GERROLD IS MUCH MORE THAN A 'RENT-A-TRIBBLE' AT A CONVENTION, AS WENDY GRAHAM DISCOVERED IN MANCHESTER RECENTLY, FOR HE'S STILL POUNDING A TYPEWRITER FOR HIS DAILY BREAD, AS WELL AS TEACHING HIS CRAFT

When I heard that David Gerrold was to guest at UFP *Star Trek* Convention in Manchester earlier this year my heart sank a little. Sure I'd enjoyed his background books on *Trek* and I'd read a couple of his non-*Trek* SF works but I had the feeling that, with writing a book all about how he wrote a *Star Trek* TV script, this guy's ego was just a little on the large size. And it all smacked just a bit of cashing in.

WRONG. David wrote the books and is a guest at every con he can because he is an out and out *Trek* fan, and because he is a thoroughly nice guy who dives into a con, and paddles merrily round like a floppy puppy which endears itself to everyone.

And David worked very hard during his visit. Not only did he bring over boxes of books and trivia which he and Bjo Trimble donated to charity via the auction, but he waived all payments except expenses, enabling a healthy charity donation.

Plus, how many guests hold an all-night room party, and invite everyone?

In recent years David has been involved with *Buck Rogers* and script-edited and written five episodes for the series *Land of the Lost*. At present he is working on scripts for TV and two films, plus he is half way through a five-part book series – and he finds time to teach writing techniques, write for *Starlog* and for a computer magazine.

'I very much enjoy the teaching. The main aim is not to teach such things as grammar or whatever, but to sweep away the wrong ideas people have about writing. I have to try to shift their viewpoints – and this applies to anyone who wants to write anything. You see, people have this model of creation in writing as some sort of sacred state, but it isn't.

'Creative writing is sitting down at the typewriter, or with pen and paper, and writing down the words, telling the story you want to tell. It's a matter of simply doing it. What you write may be very good or it may not, but until you write it down it can't be anything.

'I also help people to recognise why they aren't writing successfully. I think we all know the time when we don't want to do something so we find all sorts of other things to do to put it off. You have to be able to recognise that for example, and then, maybe, go with it for a bit, then sit down and start to work again.

'It happens to me, so I break off, read a magazine or wash dishes, then I insist with myself that I sit down and get working again.

The right attitude

'We have to look at people's models of writing. At the beginning of their career, at the beginning of their first effort, they have to say to themselves *"I am a writer"* and not *"I'm going to be a writer"*. Writing success lies with the person's fundamental attitude. I keep telling them creation is not a sacred art.'

David's two-hour crash course in writing at the convention was attended by 35.

'I very much enjoy encouraging other people to write. I've read many *Trek* fanzines. A minority have twisted the format and the characters out of all recognition – the writers have projected their own fantasies onto the series (I think he meant K/S material) but the normal magazines are a good reflection of fans and their feelings for *Star Trek*. If I was given the job of producing *Trek* I would certainly study them – some are very moving.

'It seems the studio is listening more to the fans now, after *The Motion Picture* . . . I like *The Search for Spock* very much. It has good dialogue, it's well-paced and the story is about the characters. Leonard has done a fine job for his directing debut, but then he knows *Trek* better than just about anyone else, bar a couple of people. And the special effects are stunning. Some of the best I've seen anywhere.'

David is still much involved in Trekdom. He was one of the fan extras in *The Motion Picture* (where he had 'the extreme good sense to stand next to the director's wife', and discovered that though the grey uniforms looked pretty snappy they had one big problem – the zips were at the back . . .) and he gave advice on format for the two other films.

And, as he modestly explained: 'In *Search* my favourite bit is the scene with the Tribbles.

He's also writing a new *Star Trek* novel, with the working title *To Shroud the Sky* and has threatened his agent over getting the novelisation for *Trek 4*.

Previews for fans

David scored a hit at the convention by bringing over fans' first taste of *Search* in the form of a three-minute preview plus slide stills, as well as a longer film on the making of *TMP* and told all he could without giving away any secrets.

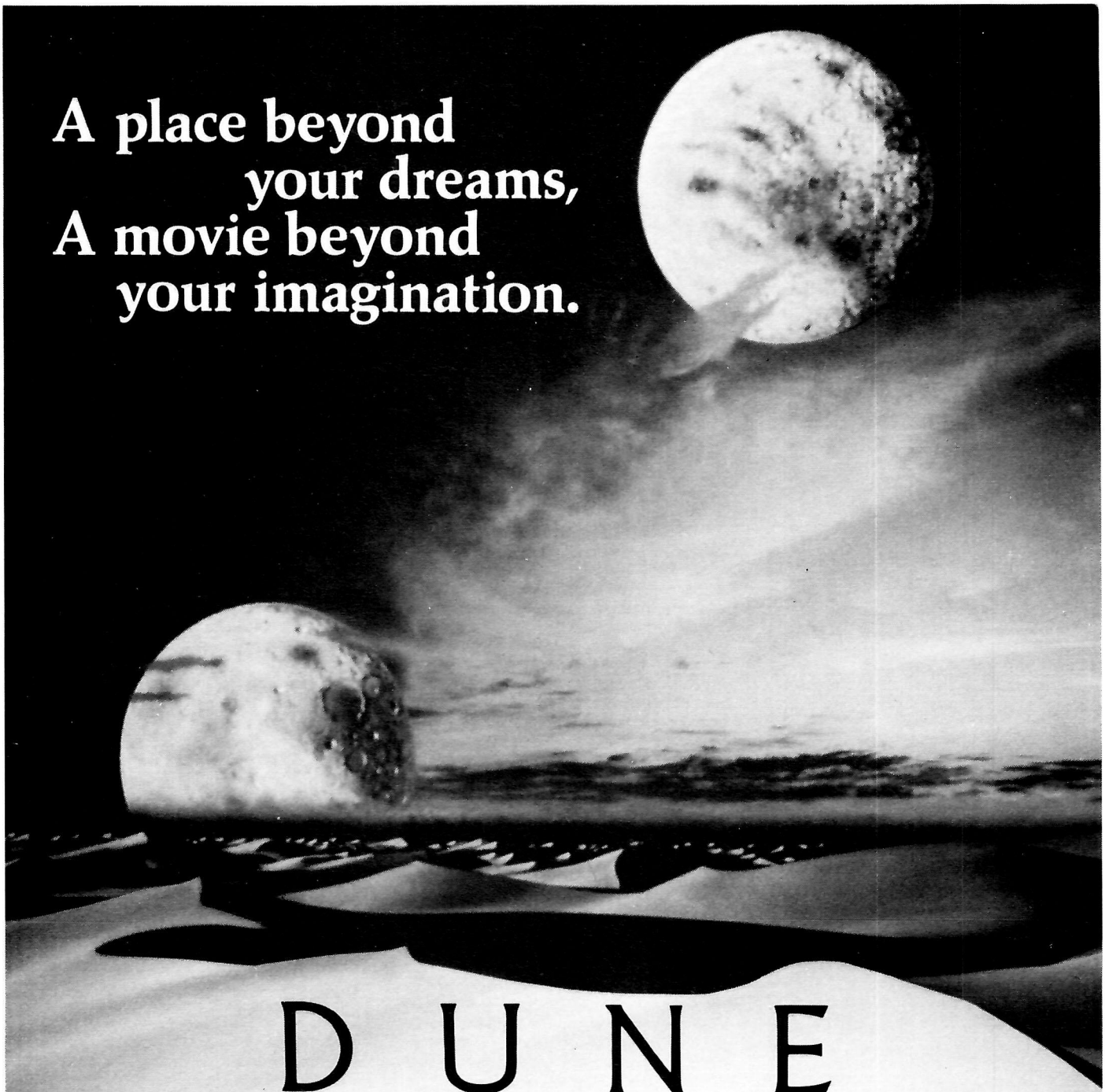
This was not the first time the 39-year-old writer has been over to Britain – he has made many trips over the Atlantic and lived in Dublin for six months in the early 1970s.

'I love this country' he said. 'If someone says "come to England" that's all I have to hear.' Home for him while waiting for the Transatlantic phone to ring is just outside Los Angeles, in the San Fernando Valley.

California is noted for its equitable climate, so when David consulted the calendar and friends he was told 'May in England is always cold and rainy' (and this was Manchester too!) He went out and bought himself a raincoat.

This raincoat became the theme note for the whole UFP convention for readers may remember that our weather was having one of its periodic attempts to confuse us all with hot and sunny days and David never got to wear his coat, aptly branded 'London Fog'.

At every opening David either complained that he couldn't wear his raincoat, or about the way he had to watch out for double meanings in everything he said.



DUNE

THE MOTION PICTURE EVENT

DINO DE LAURENTIIS Presents
A DAVID LYNCH Film "DUNE"

Screenplay by DAVID LYNCH Based on the novel by FRANK HERBERT Edited by ANTONY GIBBS

Mechanical Special Effects by KIT WEST Additional Visual Special Effects by ALBERT WHITLOCK Creatures Created by CARLO RAMBALDI Costume Design by BOB RINGWOOD

Production Design by ANTHONY MASTERS Director of Photography FREDDIE FRANCIS

Associate Producer JOSE LOPEZ RODERO Produced by RAFFAELLA DE LAURENTIIS Directed by DAVID LYNCH

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FROM DECEMBER 14 EMPIRE 1 LEICESTER SQUARE

AFTERLIFE

WILL *BLAKE'S 7* LIVE ON IN THE WAY *STAR TREK* LIVED – IN THE LIMBO – LAND OF FANS' AFFECTION AND WITH NEGLECT FROM THE MEDIA, UNTIL SOMEONE SEES SENSE AND *BRINGS BACK BLAKE'S*! WRITER TONY ATTWOOD CAUGHT THE *BLAKE* BUG WHILE COMPILING THE EPISODE GUIDE AND HAS NOW PENNED A SEQUEL TO THE NOTORIOUS *BLAKE* EPISODE. EDITOR WENDY GRAHAM IS A *BLAKE'S* FAN, SO SHE LOST NO TIME IN READING THE NEW NOVEL TONY HAS WRITTEN – *AFTERLIFE* – AND TALKING TO TONY – ITS AUTHOR

Three years have passed since The Federation finally learned how to shoot straight and in a few ambiguously climatic moments put paid to four years of resistance by the band of rebels known as *Blake's 7*.

In those three years British fans have never stopped letting the BBC know just how they felt about the decision to finish off the series which was pulling eight or more million viewers regularly and went into the BBC top ten ratings on a re-run of the last series.

Now the first tangible glimmerings of a return to life for the seven can be discerned. All four seasons have definitely been sold to America and the first fiction *Blake's 7* story, by Episode Guide compiler Tony Attwood has just been published by Target, who also publish all the *Dr Who* novelisations.

Tony was at the Leisure Hive convention in Swindon this Summer where he told me that the hardest thing about writing the book was finding the title, *Afterlife*.

'People said far kinder things than I had expected about the Episode Guide' said Tony 'and I got a lot of mail. There were five errors in the hardback edition of the episode guide, but these were corrected for the paperback edition.

'I thought that there was life yet in *Blake's* after that, so I went back to Terry Nation, who vetted the synopsis and first four chapters and okay'ed the project. W H Allen, the publishers, thought it was "spot on" so I went ahead.'

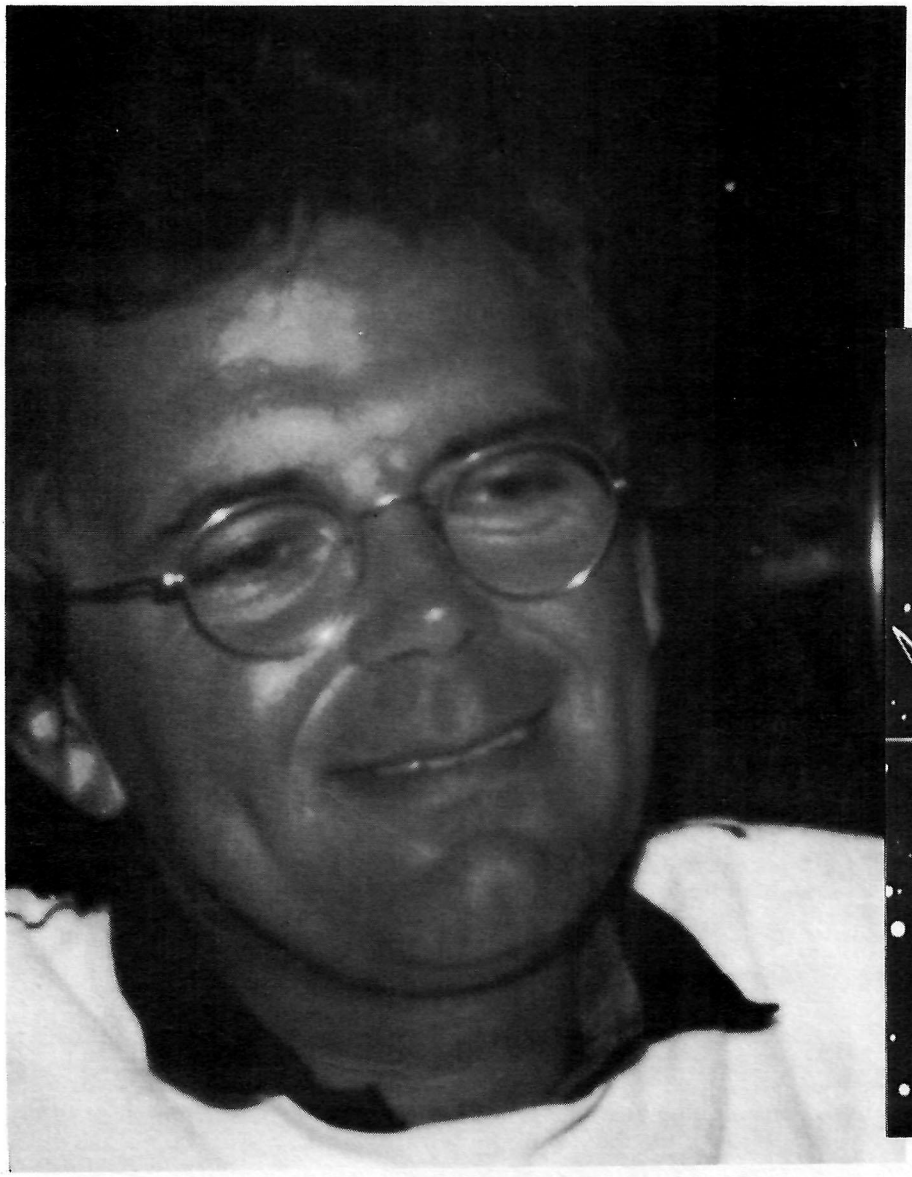
Tony's greatest problem in compiling the Episode Guide was unravelling the highly complex copyright mesh tangled around the series. Tony had to obtain no less than 35 different agreements before he could produce the book and 'with only one exception everyone was very helpful'.

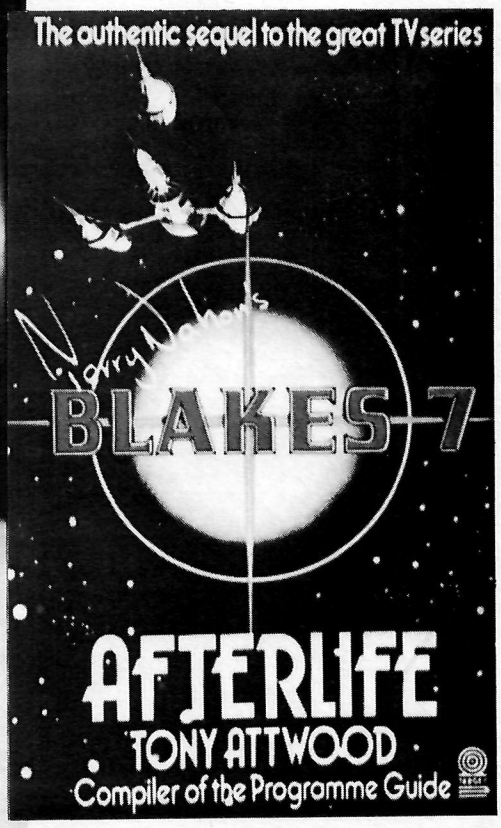
The situation was not so complex for *Afterlife*, and Tony has managed to move his characters from the BBC's copyright set and out of their copyright costumes. Terry Nation holds the rights to the characters.

'Terry Nation is very pleased for *Blake's* to live on' said Tony, who has plans for a sequal book *State of Mind*.

Afterlife opens on Gauda Prime, about four months after the events of the final 'episode, *Blake*'. Tony has gone with most fans in deciding that Avon and Vila have survived, and there is a glimpse of another of the seven in the book. One regular character is killed and Avon meets a new character who is very much his match. Orac comes and goes, and Vila acquires a computer which shares his predeliction for intoxicants. Tarrant pops up briefly, and no-one is sure whether the others are alive or died.

Afterlife is an interesting and complex book, which will surprise some fans, and probably annoy others, in the way the characters have been translated to the printed page.





SPACE FAMILY DAVISON

WHAT DO DR WHO AND HITCH-HIKERS GUIDE TO THE GALAXY HAVE IN COMMON? ANSWER ONE IS DOUGLAS ADAMS, DR WHO SCRIPT EDITOR AND CREATOR AND WRITER OF HITCH-HIKERS. ANSWER TWO IS HUSBAND AND WIFE TEAM OF PETER DAVISON AND SANDRA DICKINSON. WENDY GRAHAM CAUGHT UP WITH THE COUPLE WHO TRAVELLED SPACE IN DISSIMILAR BUT EQUALLY UNLIKELY SHIPS

Casting a very blond American actress in a part which called for a dark-haired English lady could have been just one of those weird things which casting directors do, according to authors, to ruin their works.

But mega-imaginative writer Douglas Adams found himself getting used to a tiny American actress with a squeek of a voice playing Tricia McMillan, in the BBC TV version of his *Hitchhikers Guide to the Galaxy*.

Douglas's series had already been on the radio when the BBC decided to attempt translating it to the screen and began casting.

'Two other actresses had already played Trillian in the radio version', said Sandra Dickinson when we met as she was appearing at Blackpool's Grand Theatre during a tour round Britain as Corrie Bratter, Neil Simon's newly wed in *Barefoot in the Park*. Appearing as her husband of six days in the play, and as her husband of five years during the interview was one Peter Davison.

'Douglas wrote the parts for the actors to some extent, and he was wary of casting me at first, but gradually the part of Trillian was developed for me to play her.

'If the planned second series had been made there would have been much more Trillian' (and of course it was Trillian who finally sorted out everything to save the galaxy, and *Life, the Universe and Everything*, in the book of that name, the third of the *Hitchhiker's* trilogy).

'The second series was planned but never went into production – first this hitch then that hiccup and it faded away.

'But I have heard that a film is being planned in America – though I can't see them asking me to be Trillian for that'.

Versatile actress Sandra was born in Washington and was educated at the Universities of Boston and Wisconsin, before crossing the Atlantic about 14 years ago, where she

Sandra Dickinson as Trillian, with Mark Wing-Davey as two headed and three armed Zaphod Beeblebrox, from Hitch-Hikers Guide to the Galaxy. Photo: BBC.

continued to study drama, plus singing and dancing at the prestigious Central School of Speech and Drama in London.

Another aspiring student at the Central School was Peter Davison, but it wasn't until some years later that the couple were more than simply fellow students. They were appearing in a Shakespearean play – *Midsummer Night's Dream* . . . as the lovers – and gradually fiction became fact.

'Sandra describes herself as a homebody, and their home in Surrey, in the South of England amidst commuter suburbs of London and rolling green hills, is also a haven for their four cats and two dogs, under the care of a willing sister while the couple were on the nine-week tour.

Peter Davison in his Doctor days. Photo: BBC.

Lots of imagination

'I found it hard to do *Hitchhikers* because I'd never done SF on television before,' said Sandra. 'It took lots of imagining when doing things involving visual effects, and the work was hard – but great fun – anyway. We only had one day in the studio for each episode, so that one day was very hectic indeed.

'A lot of Hitchhiker's was filmed on location. For example, we spent a lot of time in a clay pit in Cornwall, where they'd forgotten to organise loos at first – which made it very interesting.

Sandra is very much a multi-media actress as her varied acting credits show – she has done everything from award-winning adverts to theatre tours, TV and big budget cinema.

Besides *Hitchhiker's* she has appeared in *The Tomorrow People,* an early 70s Thames Television series about teenagers who had evolved with paranormal powers, and in which (you've guessed it) Peter Davison also appeared, plus two SF films, *Superman III* and *Supergirl.*

Her theatre credits range from straight drama to comedy, and that peculiarly British phenomenon, Pantomime, when she appeared in the title role of *Cinderella.* Other credits include *Jumpers* and *The Misanthrope.*

Not content with that she has recorded three singles and sang, again with Peter, (who wrote it) the theme song for a children's programme about a wooden spoon with a penchant for space travel (yes really) *Button Moon.*

At the end of the *Barefoot* tour Sandra and Peter were hoping to take a holiday over in America 'where we can walk down the street and not be recognised. It can be very precious to be anonymous once in a while.

'Though I'm usually all right until I open my mouth . . .'

Playing *Doctor Who* brought a special kind of recognition for actor Peter Davison. People finally got to know him by name rather than as that scallywag vet lad from *All Creatures Great and Small,* the series which first brought him firmly into the public eye.

'But it is not always a good thing to be recognised in the street,' said Peter, 'even though I've not got what you might call an instantly memorable face.'

'I'm lucky in that I'm not always playing the same sort of person – that sort of casting is prevalent in the States, where actors very often simply play themselves to a large extent. John Wayne was always John Wayne, and the same with Jimmy Stewart and Cary Grant.'

Peter's TV credits besides Tristan Farnon and the Doctor include *Love for Lydia,* a Granada thriller *Print Out, Holding the Fort,* children's series *Once upon a Time* and his own favourite *Sink or Swim.* His latest offering is the BBC's *Anna of the Five Towns* due out in the Autumn.

First TV was several episodes of *The Tomorrow People* in which he was such a hit that after that he worked in Twickenham Tax Office for a while!

He has a second talent as a singer/songwriter, with two TV themes to his credit already – *Mixed Blessings* and *Button Moon,* though at present work is keeping him so busy that there is little time for the guitar and pen.

'People over here get the wrong idea about *Dr Who* in the States', he said. 'It is very big with the fans – there were twelve thousand at the Chicago convention last year – too many really – but as it is shown on Public Broadcasting channels, not the big networks, it isn't that well known to the general public. They know me better there from *All Creatures* though even then I can still walk down the street unrecognised most of the time.

'I did enjoy doing *Dr Who,* though it got frustrating towards the end, as there wasn't the time to do it well, and we weren't given good scripts.'

Peter explained that some of the scripts were written by people new to SF script writing who didn't really grasp the possibilities of the genre.

'And the humour was cut right down, probably as an anti-Tom Baker reaction. I was always trying to put humour back in.

Cut backs in budget

'There just wasn't the time to do it well. We were doing without rehearsals and the budgets were cut back.

'It seems that if you have a success they cut the budget because they've got the viewers, but if something hasn't caught on and they think it should they pour money in.

'We had to cut down from 28 to 26 episodes simply because of money. SF is expensive but it seemed sometimes that *Dr Who* survived in spite of the BBC.

'John Nathan Turner is very concerned about the programme and the fans, which helped a lot, because a series can die of inertia.

'Two examples of this were the second series of *Hitchhikers* and, possibly, *Blakes 7.*

'I very much intend and want to keep in touch with *Dr Who* and all the fans. I'm not going to cut the ties with the character, but at the same time I intend to keep a low profile for a while so that I don't tread on Colin Baker's toes.

'It is so that Colin can become established to everyone as the Doctor.

'That is why it was a shame, in a way, that they didn't do the regeneration as the last few minutes of the series, as has always happened before.

'That way, the former Doctor can sort of fade out in the time which passes to the next series and the new Doctor has a chance to establish himself.

'Colin has done one story which isn't enough to establish his Doctor to everyone, and since mine is still fresh in the memory it is that much easier for comparisons to be made.

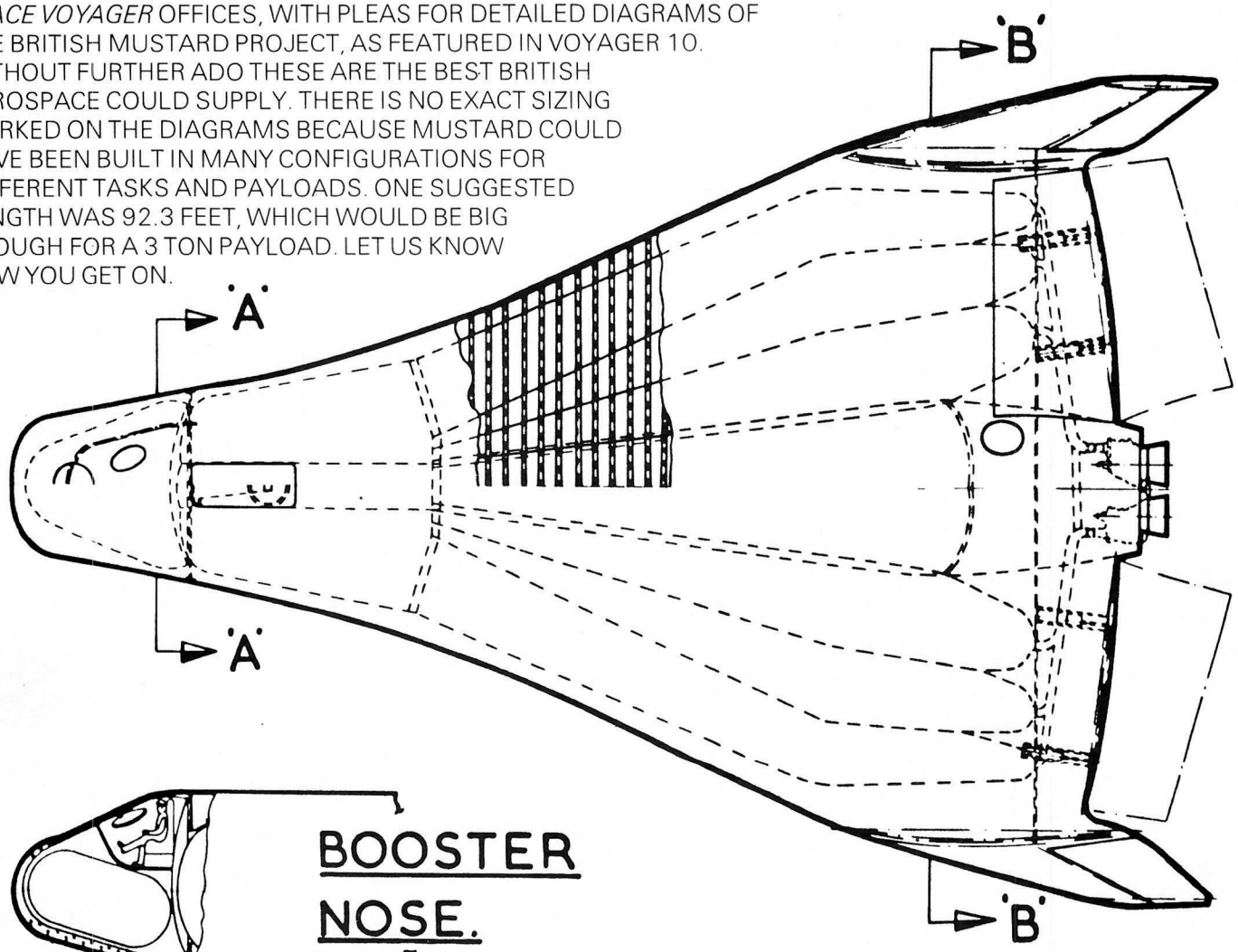
'And I think it might have been fun if they'd done the regeneration by in some way bringing in Colin's role as Maxil, the Head of Security on Gallifrey, who shot and executed me in *Arc of Infinity.*

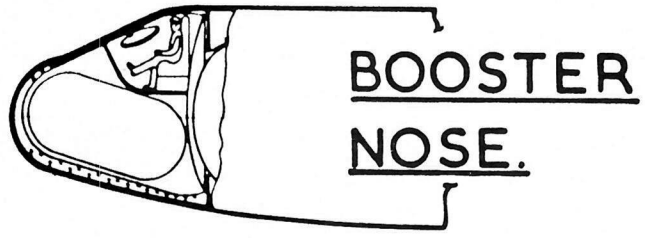
'So I don't think I'll be at conventions for a while, for Colin's sake, but after that, of course, I will when I can.'

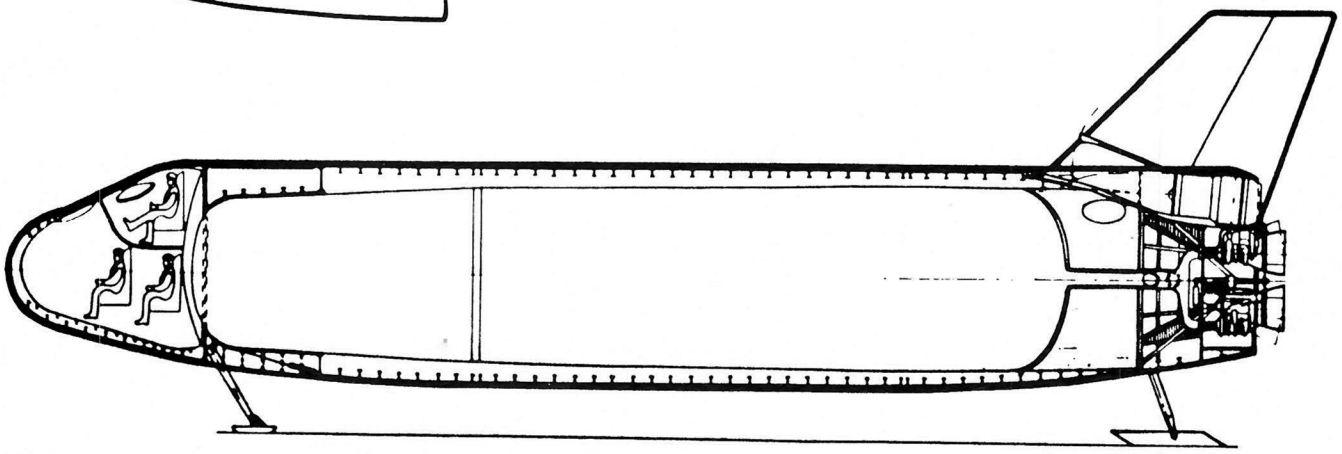
PROJECT

MUSTA

WAILS OF ANGUISH FROM MODELLING READERS HAVE REACHED THE *SPACE VOYAGER* OFFICES, WITH PLEAS FOR DETAILED DIAGRAMS OF THE BRITISH MUSTARD PROJECT, AS FEATURED IN VOYAGER 10. WITHOUT FURTHER ADO THESE ARE THE BEST BRITISH AEROSPACE COULD SUPPLY. THERE IS NO EXACT SIZING MARKED ON THE DIAGRAMS BECAUSE MUSTARD COULD HAVE BEEN BUILT IN MANY CONFIGURATIONS FOR DIFFERENT TASKS AND PAYLOADS. ONE SUGGESTED LENGTH WAS 92.3 FEET, WHICH WOULD BE BIG ENOUGH FOR A 3 TON PAYLOAD. LET US KNOW HOW YOU GET ON.







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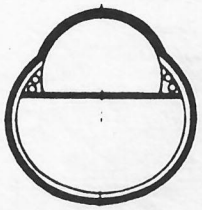

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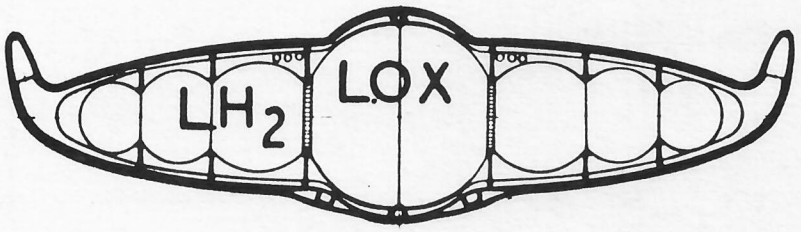

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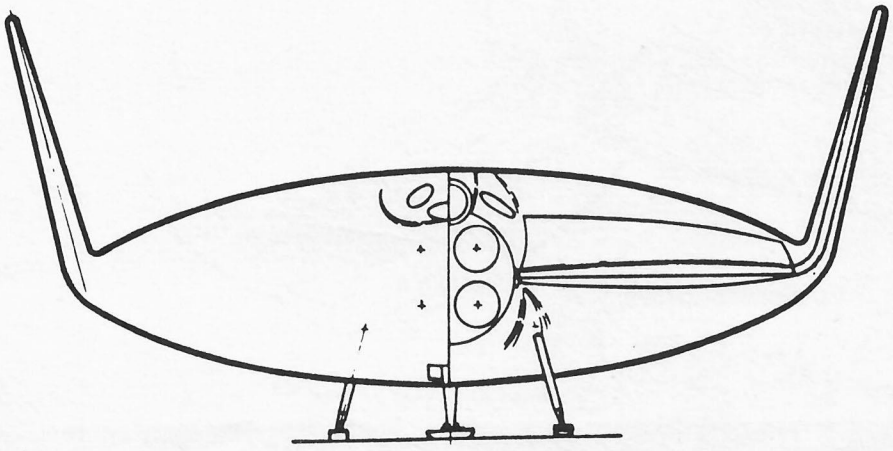

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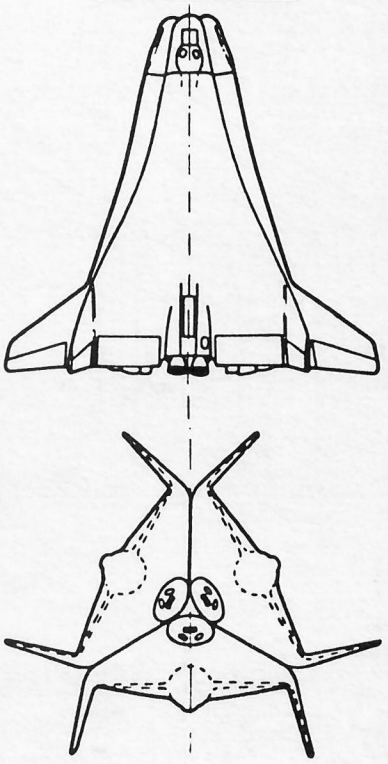

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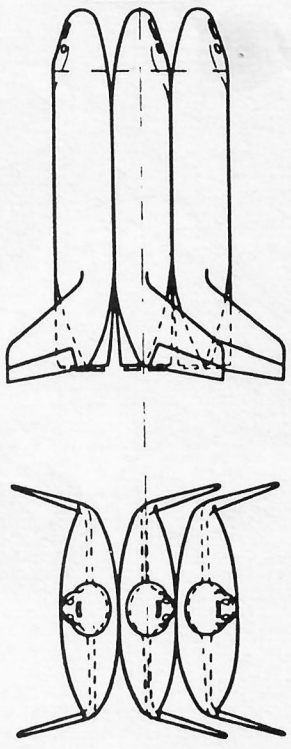
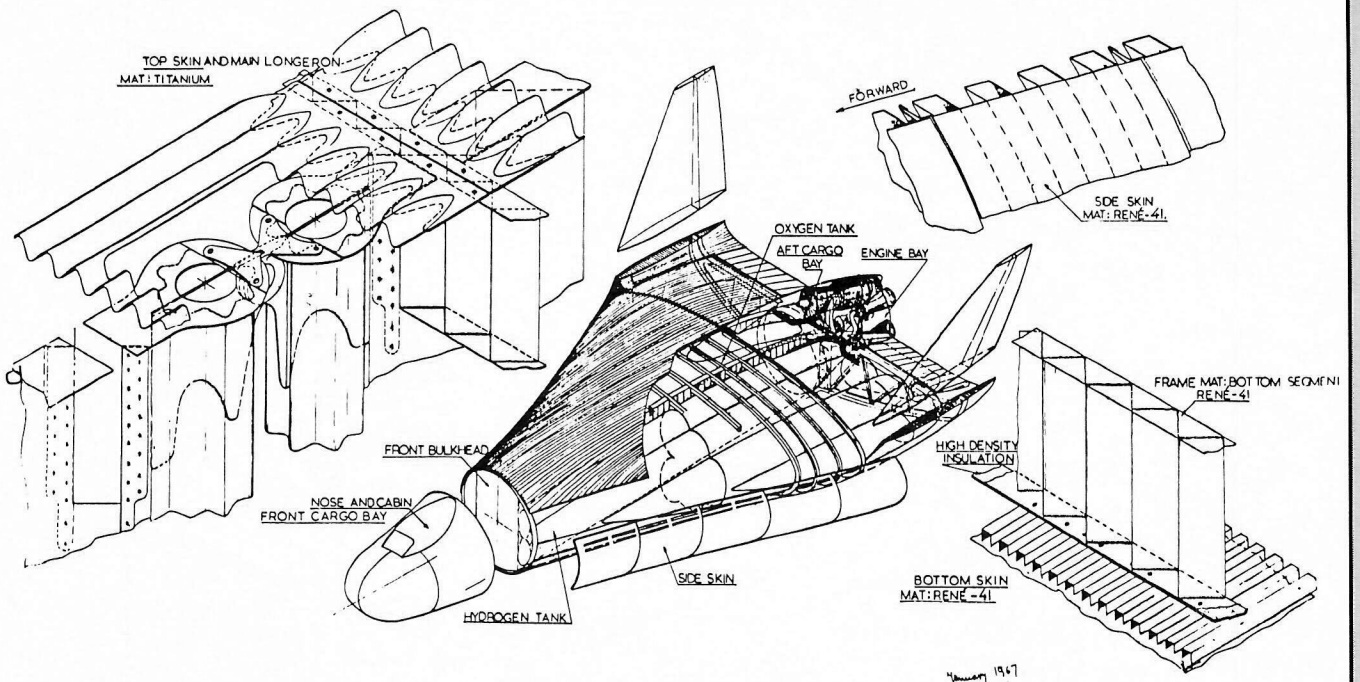
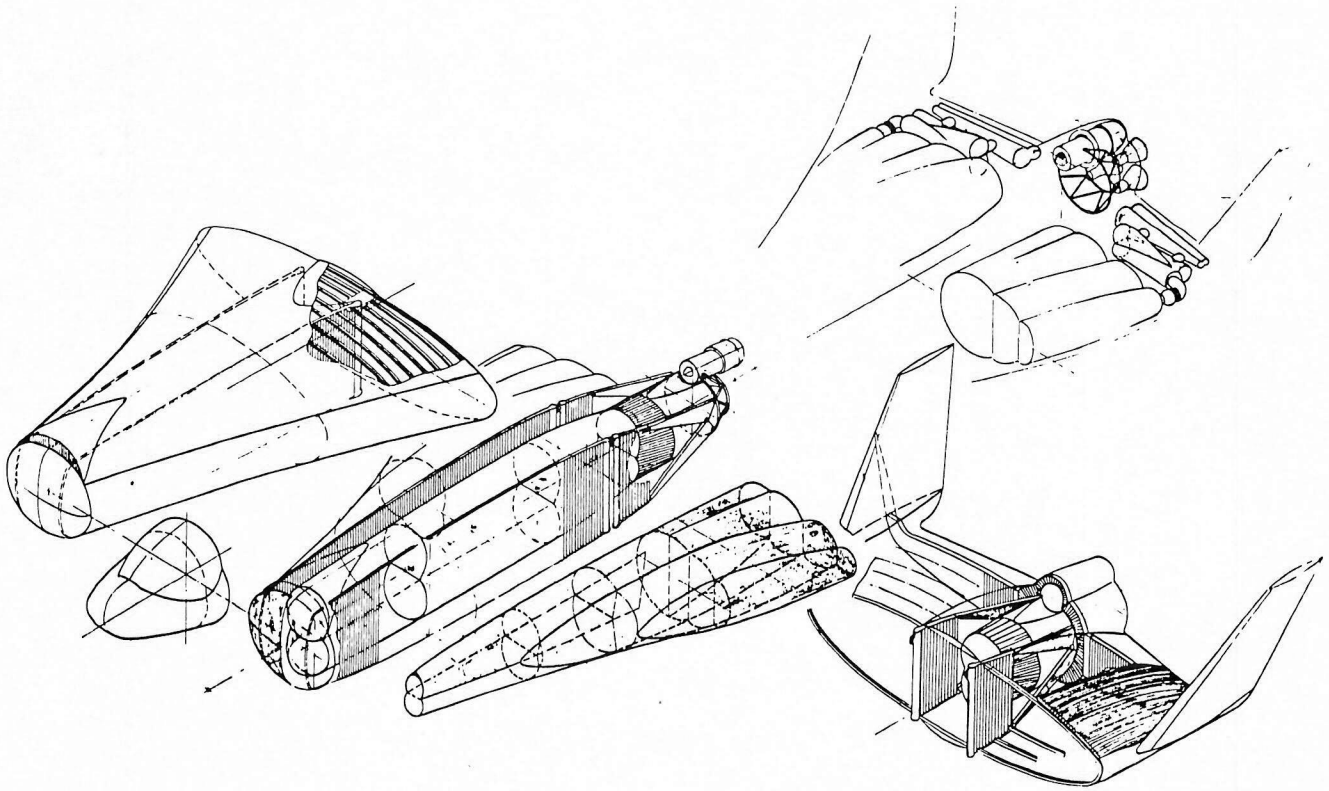




January 1967

-MUSTARD- PROPOSED BASIC STRUCTURE AND GENERAL ARRANGEMENT



20 Dec 1967

WHO Preview

There are a lot of old faces included in the line-up for the next series of *Dr Who*, scheduled for screening in the New Year.

Details so far available as *Space Voyager* goes to press show Patrick Troughton returning as the Second Doctor, with Frazer Hines again as Jamie McCrimmon, plus a welcome return to the SF genre for *Blake's 7* star Jacqueline Pearce, as Chessene in the only three-parter of the season, *The Two Doctors*, which is being filmed in Seville, Spain.

This will form the third story of the series and in change of format all episodes of the season will be 45 minutes long. *Who* Producer John Nathan-Turner told *Voyager* that the change was made to make the stories easier to follow, and because short episode cliff-hangers were forced at times.

Two Doctors will also feature John Stratton as Shockeye and James Saxon from *Brass*, as Oscar. Written by Robert Holmes, the story, mainly set on Earth, and with Seville appearing as Seville, is being directed by Peter Moffatt.

The first story of the season, coded story 6T brings back *Dr Who*'s all-time second-favourite villains the Cybermen. New Doctor Colin Baker will be fending off the *Attack of the Cybermen* on Earth and on their home planet of Telos with both studio recording and location work at a quarry in Denham.

Attack is only the second ever *Who* story to be written by a solo woman, Paula Moore and is directed by Matthew Robinson.

The cast includes Maurice Colbourne, back as Lytton, Brian Glover as Griffiths, impressionist Faith Brown as Flast and former *Blue Peter* presenter Sarah Green as Varne.

Vengeance on Varos has been recorded solely in the studio, and guest cast are Sean Connery's son Jason as Jondar and Martin Jarvis as the Governor. It has been written by Phillip Martin and directed by Ron Jones.

Story 6X, the fourth in the season is *The Mark of the Rani*. Only details available is that it is written by Pip and Jane Baker (no relation to either Doctor) and directed by Sarah Hellings.

Pennant Roberts and Graeme Harper will direct the last two two-parters.

COMMUNICATIONS BANK

Referee?

In the latest copy of *Voyager* (No 10) I read with interest the letter about *Battlestar Galactica* from Wendy Metcalfe. In it she proves her point well against Graham Williams but I think that what Mr Williams meant was not what Mrs Metcalfe interpreted.

The background stories and scripts for *Galactica* are as good as any other but the production of the special effects and general overall production is rather low. In many an episode scenes from the film *Silent Running* are used to represent the agricultural ships. This is most probably the kind of thing that Mr Williams is on about. As for the final of *Galactica's Conquest Of Earth* only Lorne Greene stars from the original cast and the story line for this triumphant ending of the saga is really a let down after the promising beginnings of *Galactica.*

I think that *Battlestar Galactica* was an exploitation of science fiction in some respects as it was a good story which was put across to the viewers incorrectly using a lower budget than should have been. An example of this budget cutting is in *Mission Galactica.* At one point a number of missiles are launched from a Battlestar and the shots shown are actually scenes of an Apollo rocket in flight.

If Mrs Metcalfe is such an interested *Galactica* fan then surely she would have noticed these errors. In some way I hope this brings about some form of settlement between Mr Williams and Mrs Metcalfe as I think both are correct in their own right.

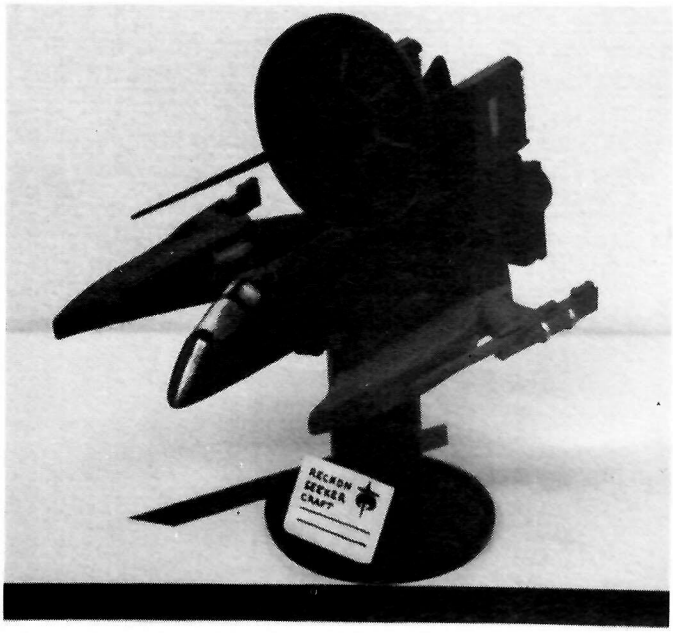
I also hope that *Voyager* continues to cover SF Model making with the interest it has in the past as I for one have learnt a few new tricks from articles within your magazine. Enclosed are a few shots of my results from scratchbuilding with the help of the Space Modelling article featured in *Voyager* No 3. I hope you find them of interest.

In *Voyager* No 10 the photo on page 46 is the wrong way round. I appreciate that some aliens elsewhere most probably find it of interest but personally my eyes find it hard to comprehend. I wonder if my copy of *Voyager* was intended for the export trade for foreign readers of Alpha Centauri. In that case I may have a collector's item but there again every copy of *Voyager* is a collector's item when compared to other similar publications.

Spennymoor *Paul Trueman*
Co Durham

Thank goodness – a referee in the lists for the joust between Mr Williams and Mrs Metcalfe!

Re the 'flopped' photo. We at Space Voyager *are a modest lot, and anyway the Audit Bureau of Circulations (the body which calculates official circulations for most publications in this country) wouldn't believe us, but you guessed it . . .* Space Voyager *does produce a subspace transmitted facsimile edition for readers on Alpha Centauri . . .*



Bring Back Blake's!

I caught issue 10 of your unique magazine and was delighted to have found at last a publication that treated its readers unpatronisingly and intelligently. So much so that I have now placed a regular order for it with my Newsagent. The mixing of science fact and science fiction articles is an inspired one, not to say a downright brave move and an extremely commendable one. The magazine has now kindled my interest in things such as space exploration and modelling, perhaps by the highly interesting way in which they were written.

My main interest though is in British SF, mainly *Doctor Who* and *Blake's 7.* The former is rather well documented in *Space Voyager* but I would love to see much more coverage on the latter. Ever since *Blake's 7* magazine folded there has been a large void for *Blake's* fans (apart from fanzines and clubs) which is just itching to be filled.

News on what the stars are doing and particularly what the fans are doing would not go amiss and would be much appreciated.

The series did end rather openly, remember, and it was always very popular so there is no reason why the BBC could not bring it back (I have even written my own solution to the ending to prove the point) I am sure I speak for many *Blake's* fans who will never let the programme die. So, more *Blake's 7* please. Whatever happens I'll be reading.

Leasingham *Mark Stone*
Sleaford
Lincolnshire

I must blush with modesty at all the praise for Space Voyager *which comes in your letters, so thank you all on behalf of all contributors and the backroom staff at ASP. Praise for the original mix of contents must go to the magazine's founders, Ray Rimmel and Mat Irvine, and I aim to emulate their and my predecessor Ian Graham's examples.*

I'm hoping to bring you lots more on Blake's 7 – starting as I mean to continue with the coverage of the new book which is being published this month – I too am a keen Blake's supporter.

As a lowly contributor I interviewed Michael Keating in issue 5 and hope to be catching many more of the actors for interviews whenever possible.

For news of a new idea for reports on fan activities, see Data Bank.

Captain Kirk's Memory

After watching the *Star Trek* treble bill recently, I had the urge to write this letter. I have only one complaint to make. Why was the music so loud on *Star Trek 2?* I mean it is simply no good doing this sort of thing if you can't hear the dialogue.

Still on the subject of *Star Trek,* the BBC is currently screening in Original order but they have banned four episodes: *Miri,* first screened in 1970 (I remember the episode very well) *Plato's Stepchildren, The Empath* and *Whom Gods Destroy.* These episodes have never been screened according to the BBC. *Star Trek* wouldn't be *Star Trek* without these episodes.

In one episode, *The Enemy Within,* there was a transporter malfunction. Now why didn't they use the shuttlecraft? Good question. The shuttlecraft did not make an appearance until episode 14, *The Galileo seven* and if Captain Kirk had brains enough then he should have used the shuttlecraft in such emergencies especially when someone is dying on a planet. The shuttlecraft could be used when the transporter is not working. Like in the Star Trek film where the transporter wasn't one hundred percent operational.

If the Enterprise is carrying a shuttlecraft then why is Captain Kirk always relying on the transporters? I agree with Allan Asherman who is the author of the Star Trek Compendium.

In the second pilot episode *Where No Man Has Gone Before,* we see Gary Mitchell making Captain Kirk's grave. Now if you look carefully at the tombstone you should see that he has misspelt Kirk's name. Instead of James T. Kirk, it was written James R. Kirk. Someone must have goofed somewhere.

Peckham *Phillip Rochester*
London

I agree that it is a pity that BBC viewers can't see the four contentious episodes, but at least they are available for rental on video (see Products section in this issue).

Captain Kirk couldn't use the shuttlecraft in 'The Enemy Within' *because he didn't know he had shuttlecrafts then – much of* Star

PUBLISHERS' NOTE: The editor reserves the right to snorten letters for publication; opinions expressed by readers are not necessarily those of either the editor or publisher. .

Trek *developed as the story went on and it wasn't until* Galileo Seven *that the writers decided to give shuttles to the Enterprise. The same happened with Spock's background on Vulcan, the neck-pinch and his mind melding abilities.*

If this wasn't the case, then either someone forgot about shuttlecraft when the script went through, or we fall back on dramatic reasons.

After all, in Star Trek – The Motion Picture, *why, when the Enterprise's transporters were out, could not the Earth or Space Dock ones have been used? Cynics among us would argue that it was simply so we could have six hours of Kirk looking at the Enterprise.*

To be fair, Star Trek *fans – and SF fans in general, are so knowledgeable about the programmes that all these inconsistencies (which wouldn't be noticed in anything else) are picked up straight away.*

SFX Clangers

I have read *Space Voyager* from the start and found every issue entertaining and informative. I'd like to say thank-you for staying non-political and carrying news of ESA and Soviet space efforts as well as NASA.

On a more frivolous note: Simon Goodall spotted SFX flaws in *Close Encounters of the Third Kind,* RCJ. Clay did the same for *2001 A Space Odyssey.* I've seen both films quite a few times and feel happy to be able to say that although I did notice the moving starfield I was able to ignore it and I've watched *CE3K* since reading Mr Goodall's letter but fortunately I forgot it soon after the film started. Can I suggest to such people that they treat such films as the gifts they surely are and receive them in the spirit in which they are given.

Finally I think Mrs Metcalfe is projecting her own ideas onto *Battlestar Galactica.* Battlestar never claimed to be anything more than entertainment and, Mr Williams, I didn't miss one episode of *Battlestar.* If there's any poison in it, it didn't affect anybody I know. The standard of SF in TV and films is appalling (except *Star Trek, CE3K, ET* and *2001)* anyway. The best medium of SF has covers.

Merstham *Ian Braidwood*
Redhill
Surrey

My feeling on this wrangle about SFX clangers is that most of the public simply don't spot them – I remember cringing at the science errors in The Black Hole *for example – it is only the avid SF fans who do, and then probably only on their umpteenth viewing, (when we've all got to the stage of knowing the dialogue backwards) and error-spotting becomes an incentive to watch 'one more time', (if you need an excuse!)*

I think you've just mixed matter and anti-matter in your last couple of sentences . . . I'll dig out my acme anti-blast brown paper bag and duck for cover as I'm sure readers will want to comment . . .

More Clangers

I am writing to comment on a letter published in *Space Voyager* 10 about the background movement of the stars in *2001: A Space Odyssey.*

This movement is caused by the fact that the camera is fixed relative to the spacecraft which is itself rotating about a slowly precessing axis. The ship rotates so that the heating by the sun is distributed around the entire hull in a short time rather than being localised in certain areas, causing expansion and structural damage.

I believe the two main errors in this superb film (and these are hardly noticeable) are;

1 The liquid nutrient consumed from a tray when Dr Floyd is drinking descend back down into the tray when the Doctor stops sucking at the tube. Under weightless conditions the liquid would remain in the tube and

2 On the lunar surface scenes a $\frac{3}{4}$-full earth is seen in the sky just before sunrise. The face of the moon would be almost full when seen from earth and so the earth ought to be a thin crescent near the sun when viewed from the moon. The correct view of the earth appeared minutes later when the monolith emitted its signal.

St Helens *William Joyce*
Merseyside

Arggggghhhhhhhhhhh!

Captain Kirk Court-Martial?

I write to say thank-you for the review of *Search for Spock.* I found it refreshing to see such an objective review. I can't agree with the comments about the planet Vulcan or the bar scene, I feel they were better than *Flash Gordon.*

The destruction of the Enterprise was a big mistake, even though we've now seen the Excelsior, I don't seriously see Starfleet Command giving the ship to Admiral Kirk. In fact I think he'll be court-martialled (along with some crew).

I'm sure I'm not alone in wishing Paramount Pictures would stop pussy-footing around, churning millions of dollars into the films and start producing television episodes again. At least they could experiment with more new characters and situations (with less expense).

I don't want to be accused of wanting to see the end of Kirk, Scotty, McCoy etc, far from it, but even the most ardent fans must realise they're all getting older – if anything the TV series of *Star Trek* is ageing a lot better than they are.

Southend on Sea *Jacqueline Roe*
Essex

PS 79 episodes and three films and we still don't know who Captain Slog is

I agree with your comment about the 'Big E', and we're in good company – see Gene Roddenberry's comments elsewhere in this issue. I liked the bar scene too – but then I like Tribbles. I don't think there's too much chance of us seeing Trek *on TV (as episodes) – and writing of* Trek *on TV, how many of you missed* Star Trek – The Motion Picture *only to hear later it was the special recut version, which was shown without a word of warning to any of us . . .*

Captain Slog is presumably the Starfleet unfortunate with the final front ear . . .

Lizard Lover

My favourite bit in *Space Voyager* is when you do articles on Science Fiction films like the *Star Wars* Saga and *Star Trek* etc. Recently on TV there was a 10-hour science fiction film called *'V'* and for those 10 hours I was glued to the TV in excitement.

I was wondering if you could do an article on *'V'*. I'm sure there would be many other people who would be interested in reading about it. If you are unable to do this, would you please do me a big favour and find the real name of the actor who played Martin.

Stoughton *Karen Shorter*
Guildford *Age 14*
Surrey

Your wish is Space Voyager's *command, Karen. See elsewhere in this issue for the latest on 'V' which everyone in the country lost sleep over, it seems.*

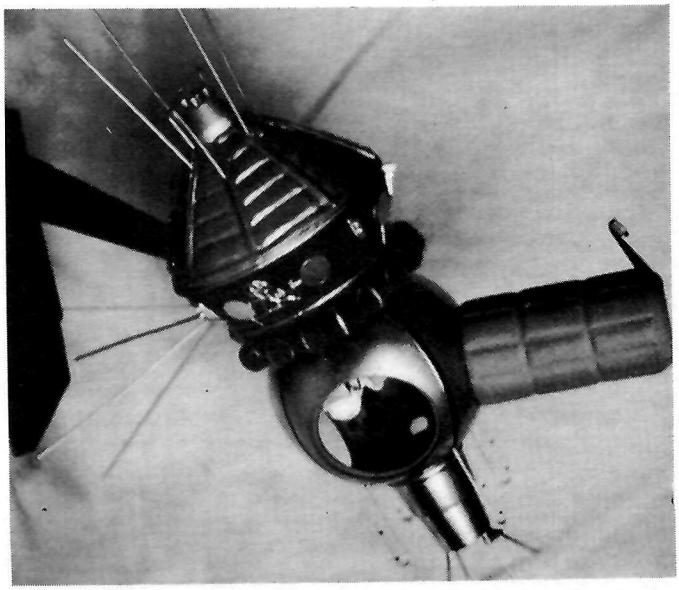
Scratch building

I thought you might be interested to see a photograph of the model of Voskhod II I built by converting a Plasticart Vostok ($\frac{1}{25}$) kit, the same kit which was reviewed by Mat Irvine in the August '82 issue of *Voyager.* The Aleksey Leonov figure was made from a $\frac{1}{25}$ Tamiya figure of General George Patton . . .

London *Ken Harman*
Ontario

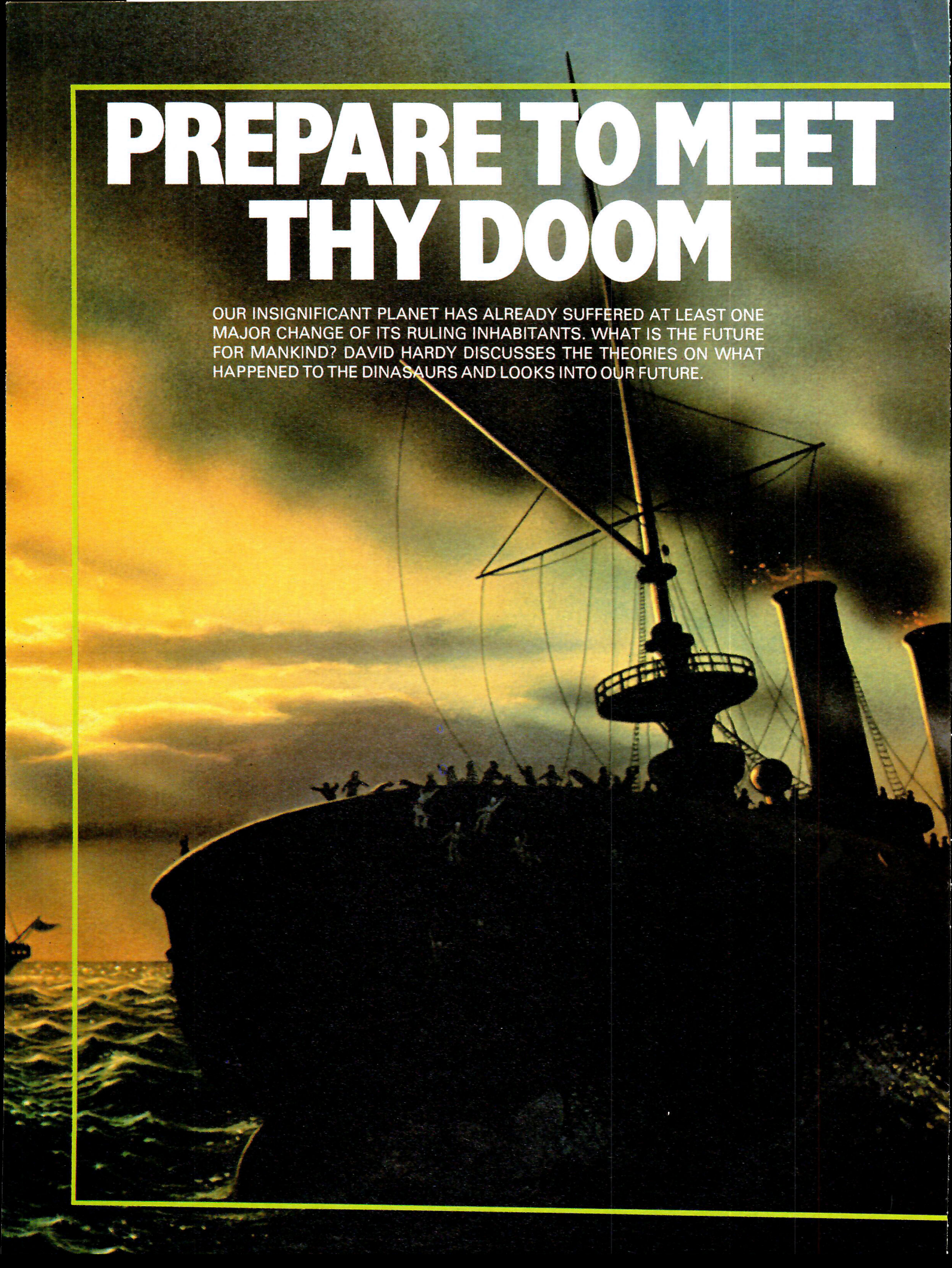
Thanks for the photo Ken. Always delighted to hear from overseas readers.

Continued page 74



PREPARE TO MEET THY DOOM

OUR INSIGNIFICANT PLANET HAS ALREADY SUFFERED AT LEAST ONE MAJOR CHANGE OF ITS RULING INHABITANTS. WHAT IS THE FUTURE FOR MANKIND? DAVID HARDY DISCUSSES THE THEORIES ON WHAT HAPPENED TO THE DINASAURS AND LOOKS INTO OUR FUTURE.



There is little doubt about how life on Earth will end – barring 'accidents' – and no-one reading this is likely to lose any sleep over it, for, it won't happen for billions of years, when the Sun has begun to swell into a red giant and its output of heat and radiation increases dramatically. Then, first one then another life-form will become extinct; the oceans will evaporate, the atmosphere will be driven off into space and finally the Earth, now a shrivelled cinder, will circle close to the swelling red Sun, or may even be engulfed by it.

Dinosaurs, having ruled the world for almost 140 million years, may well have felt the same way (had they possessed the brainpower to reason thus; for an account of an Earth on which dinosaurs attained intelligence, Harry Harrison's latest book *West of Eden* is recommended reading). They became extinct, along with some 70 per cent of the species alive at the time, 65 million years ago. How? Could the same thing happen to us? Or what other frightening fates could lie in store for Man and his contemporaries, to bring an end to life – or, at the very least, society – 'as we know it'?

SF books, movies and television have provided a variety of scenarios, many of them improbable to put it mildly. We have seen a motley array of invaders from alien planets, stars, galaxies or 'beyond space', all the way from H G Wells's tentacled Martians to lizards disguised as humans who try to steal our water as well as our protein (as did those Martians, come to think of it). The earth has suffered a *Crack* and *Caught Fire,* amongst other more/less probable nuclear futures. It has been blasted by all kinds of beams and rays; beset by mutated bacteria, bugs and insects or runaway radiation; threatened by revived dinosaurs or stray meteors and comets; and destroyed by passing stars.

Whether or not those portrayals of Armageddon were convincing as films has no bearing on their plausibility as forecasts, of course. It now seems unlikely that Earth will get kicked out of its orbit by the effects of nuclear weapons; but there are worse futures which are made highly possible by those obscene instruments of destruction. Natural or man-aided mutations could produce deadly strains of bacteria or viruses – indeed they exist today – that would cause worldwide plague if allowed to run riot in our atmosphere or water supplies. And threats from outer space? We can rule out invaders from Mars, but a visit from the planets of other stars has to remain a possibility at any time, though it is much more likely to be a scientific expedition than a hostile force. Space holds much more probable threats . . . But the biggest danger to life on earth at this moment in its history is undoubtedly Man himself.

It must be admitted that many of those fictionalised menaces to the continued existence of life on what should be the most green and pleasant of worlds are pretty far down on the scale of probabilities. So let's examine just the few that do seem worth worrying about – and see if anything can be done to avert them. For a start, what did happen to those dinosaurs? Would solving this problem offer any clues to our own possible demise by natural causes, long before the Sun begins to swell?

Just because we regard ourselves as the Lords of Creation, the highest link in the evolutionary chain, this does not mean that our position on Earth is immutable. The dinosaurs were far from unique either: it is a sobering thought that over 90 per cent of the species that have ever lived are now extinct – and many more are on the verge of becoming so today. But the case of the dinosaurs does seem special in that they disappeared so suddenly, on the geological timescale.

The dinosaurs' fate.

Dinosaurs were reptiles, but not all reptiles used to be dinosaurs. Whatever occurred 65 million years ago killed most of the reptiles alive at the time (leaving us with such handsome relics as the alligator) but all the dinosaurs. What happened had nothing to do with the fact that they were slow-moving, slow-thinking and generally stupid – because many of them weren't. Each was adapted perfectly to its own particular habitat, and many were capable of moving at high speeds (there would be little point in their having long legs otherwise), if only in short bursts. And modern birds almost certainly evolved from Archaeopteryx, which lived in the Late Jurassic, up to 150 million years ago.

150 years ago it was first recognised that certain beds of sedimentary rock, belonging to the Cretaceous period, contained the fossil bones of creatures quite unlike any alive today. Above these – and so more recent – are rocks from the Tertiary period, which contain very few fossils and none from dinosaurs. The boundary is known as the Mesozoic era. Higher still, fossils again appear, but they are mainly of mammals. It was not until the late 1970's that explanations began to appear that could be taken seriously.

It was Luiz Alvarez, his son Walter, Frank Asaro, and Helen V Michel, all of the University of California at Berkeley, who in 1977 discovered that the thin clay layer marking the Mesozoic contained an unusual abundance of iridium. This element is rare in the Earth's crust, but common in certain types of meteorite – so the theory they advanced was that an asteroid some 10 km in diameter (the size of Manhattan) had struck the Earth, with catastrophic results.

The impact itself, whilst causing a massive crater more than 160 km (100 miles) in diameter and widespread 'local' damage due to shockwaves in both ground and atmosphere, was only the start of the problem. It threw up an immense cloud – equal to several hundred volcanic eruptions like that of Mount St Helens – of dust which, spreading out high in the stratosphere, blocked out sunlight. This in turn prevented photosynthesis – the process by which plants use sunlight to convert water and carbon dioxide (CO_2) from the air into carbohydrates to use as food, releasing oxygen. The whole ecology of the globe was disrupted.

Not too surprisingly, the hypothesis did not meet with universal approval within the scientific community. By 1982, at least seven alternatives had been proposed. Walter Alvarez and his group themselves found evidence that the dinosaurs in northeastern Montana had vanished long before the iridium stratum was laid down. Other scientists asked 'Where is the crater?'. Even after 65 million years of erosion, some trace should remain of such a massive impact.

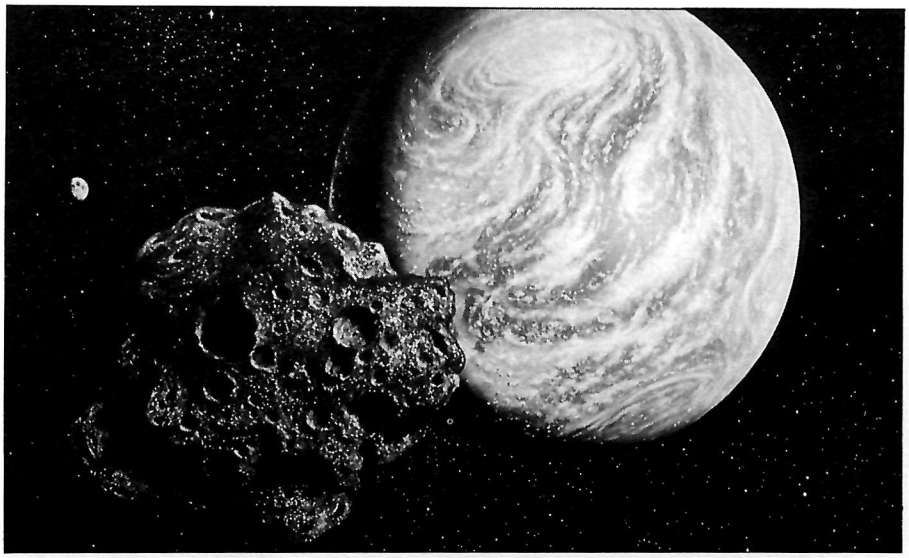
The quantity of iridium found in different parts of the world varies considerably. In the Italian Apennines it is 30 times the average, and near Copenhagen in Denmark 160 times higher. As scientist Charles Pellegrino points out, if iridium levels decrease as one moves away from the source, the impact could be in the North Sea. There is in fact an almost perfectly circular depression, over 80 km in diameter and 250 metres deep, on the sea floor some 325 km east of Dundee. It is known as 'Devil's Hole', and is certainly a candidate. A water impact is in any case favoured by odds of three to one.

If this happened, the vast quantities of water vapour blown into the atmosphere would eventually condense, falling as torrential rains. This would precipitate much of the dust, though that in the stratosphere would persist for much longer. So, rather than imagining the whole planet plunged into darkness and gloom, perhaps we should envisage only a slight decrease in global temperatures. Would this be sufficient to cause mass extinctions? Drs Leo Hickey and William A Clemens point out that if a global catastrophe occurred one would expect extinctions to take place at the same time, whereas there are intervals of up to 100 000 years between dinosaurs and plants becoming extinct in the western United States. They prefer more gradual ecological changes combined with long-term climatic cooling. Charles Drake and Charles Officer agree, suggesting a string of huge volcanic eruptions around the Pacific as the real culprit. But the latest 'final proof' of the giant meteorite theory, from the US Geological Survey in Denver, Colorado, led by B F Bohor, states that microscopic examination of the clay reveals quartz crystals which, when etched by acid, show a pattern of grooves typical only of the high pressures created by nuclear explosions or meteoric impacts, but not of volcanic eruptions. And so the controversy goes . . .

Volcanos to blame?

NASA's John O'Keefe suggests that the solar radiation was blotted out by a huge volcanic eruption not on Earth but on the Moon, while Dewey McLean argues that a terrestrial volcano was to blame – but not because of its dust cloud. A catastrophe known as the Deccan Eruption buried 300 000 square kilometres of the Indian subcontinent under 2 km of lava. According to McLean's theory, CO_2 belched out by the eruption made the oceans acidic (carbonic acid), dissolving the shells of tiny marine organisms which are known to have become extinct at that time, and also causing a 'greenhouse effect' which killed off land organisms. (We will return to this effect later.) The enriched iridium layer is explained as being due to the steady rain of micrometeorites which could now collect on the sea-floor without being mixed with or 'diluted' by the skeletons of plankton.

Geophysicist Prof Thomas J Ahrens also worked with John O'Keefe, using computer simulations to show how Alvarez's asteroid, weighing a trillion tons, would have released energy equivalent to a billion megatons of TNT. The flash of heat would have been enough, they believe, to raise the temperature of the atmosphere almost instantaneously by 10°C, and the upper layer of the ocean would also have been raised by several degrees. This would not only have killed the large marine



An Apollo asteroid, composed of dark 'carbonaceous' material, approaches Earth. Will it make a harmless fly-by and retreat into space – or strike Earth with devastating results? (From the private collection of Mrs B Evans.)

reptiles, but would have affected the food chain drastically. Smaller animals would have survived – as is proved by the fact that we are here and intelligent dinosaurs aren't! In this hypothesis it makes little difference whether the meteorite struck land or ocean, since it would plough through the latter 'like a bullet through a mud puddle'.

Some investigators prefer an impact with a comet, despite the fact that only about a third of objects striking Earth over geological time are of cometary origin. Being composed largely of ices – a 'dirty snowball' – a comet would flash into steam on impact, producing the most efficient transference of heat energy to the atmosphere. Moreover, gravitational forces may have disrupted the comet's head as it approached Earth; it would then have showered the surface with debris which would not leave any major craters as evidence.

Earth scientists John Lewis, Ronald Prinn and their associates at MIT invoke yet another cause of death: acid rain. The shock heating of the atmosphere – to several thousand degrees even 300 km ahead of the comet – would generate chemical compounds including nitric oxide (NO), which oxidises to nitrogen peroxide (NO_2) on contact with oxygen. This then reacts with atmospheric water to produce nitrous acid, which eventually falls to the ground and is quite toxic. To this, if the comet struck in an ocean, would be added hydrochloric acid and sulphur dioxide. Trees and other vegetation would be defoliated, and although the effects might only last for a few years, plant-eating dinosaurs would be badly hit – and in turn the carnivorous ones who depended upon them for food. Here again the acidic oceans would dissolve the carbonate shells of marine organisms, though those with silicate shells might survive.

Credence was lent to the comet hypothesis recently by a suggestion from Prof Richard Muller of Berkeley, again using a computer, this time to correlate the time-scales of extinction with the dates of cometary impact craters. He found that about a dozen large craters, dating from different epochs, matched periods when there were large-scale extinctions with remarkable accuracy. The team to which Muller belongs blames a distant star which they named Nemesis, normally two light-years from Earth. They claim that its long, elliptical orbit periodically brings it into the Oort Cloud of comets which surrounds our Solar System, disrupting it and sending some of them inward towards the Sun, where they may be drawn into Earth's gravitational field and strike it.

They calculate that the next collision will not occur for 15 million years. But there are many more asteroidal objects wandering around the Solar System, relics of the accretion process which originally created the planets and later – 4.5 billion years ago – bombarded them with planetesimals, leaving as evidence the craters found today on all the rocky worlds and satellites. The frequency of impacts dropped sharply some 3.5 billion years ago, but they still continue. W M Napier and S V M Clube of the Royal Observatory in Edinburgh calculate that a planetesimal (ie a small asteroid/large meteorite) of about 4 km diameter will strike Earth every 9.2 million years; one of 5 km every 14 million; one of 11 km every 58 million; and one of 30 km every 360 million years. The Cretaceous period occurred roughly 100 million years ago – so a collision with a body similar in size to the one which eliminated the dinosaurs is overdue!

Even if the impact itself was not solely responsible for the mass extinctions, imagine the chaos that would be caused by a 10 km-wide mass of rock falling at a speed of 15-30 km/sec anywhere near an inhabited area, or the tidal waves and floods if it struck an ocean. Even if the source of impacting objects is the Oort Cloud, collisions are unlikely to be single. Several impacts may occur within a few thousand or a million years, or one large impact may be accompanied by a number of smaller ones.

So impacts must have occurred again and again over geological time, and will certainly occur again. The danger at any given spot on Earth is obviously not high enough to warrant building shelters – at least, not against meteors; but could anything be done to prevent the catastrophic effects of a strike? Despite the counter-action portrayed in films like *Meteor* and *A Fire in the Sky*, there is a strong possibility that a fairly small object, yet one large enough to do a lot of damage, would escape detection until it was too close to destroy or deflect. Apollo asteroids (the name given to those which cross Earth's orbit and whose orbits are constantly being changed by the planets' gravitational fields) are dark in colour. Although observatories scan the skies nightly, there are areas which rarely receive attention. And suppose that a 1 km object was detected when it was, say, 3 million kilometres away, when it would have a magnitude of +10 (our largest telescopes can pick up faint objects down to +20; the larger the number, the dimmer the star). There would be five days before impact – but astronomers would need two or three more nights to compute its orbit with any accuracy, and longer still to predict where it would hit.

We might have a chance

Only a concerted programme with the specific purpose of detecting such objects stands any chance of success. Orbital or Moon-based telescopes would be best suited to the job, but despite the obvious immense potential saving in life and property one cannot really envisage governments attaching a high priority to such a project. On the bright side, though a 10 km object – the really dangerous one – probably would be detected photographically today, even as far away as the orbit of Jupiter. Then, at least, we should have a chance of despatching missiles to prevent its arrival, using a few dozen megatons of nuclear explosive – of which we would seem to have plenty to spare . . .

Leaving aside other real, but even less immediately probable dangers from outer space, such as other stars, wandering black holes (or mini-black holes), 'free-planets' or antimatter, our greatest problems come, as I said earlier, from Man himself. It will have become apparent by now that regardless of the mechanism of destruction, it is the short- or long-term effect on our atmosphere and climate that threatens the established order of life on Earth.

Half of the world's forests have vanished since records have been kept. Each year an area up to twice that of the British Isles is destroyed. Trees are essential, to replenish nutrients in soil, for their part in the rain cycle and in preventing both droughts and floods, and in replenishing the oxygen in the atmosphere (as well as providing habitats for animals and birds). Deforestation and burning in parts of the world like Amazonia (bigger than the whole of Europe) is doing irreparable harm – yet it continues. At the present rate, tropical forests will disappear within a mere 50 years, and one million species of plants and animals with them. But if this happens, says Dr Mary McNeil, the atmosphere will soon run out of oxygen.

While we remove vital oxygen-producing forests, we pump more and more CO_2 into the air by burning fossil fuels. Normally, the Sun's short-wave radiation heats the surface, which then re-radiates part as long-wave or infra-red. This becomes absorbed by both CO_2 and water on its way back into space, increasing the temperature of the atmosphere; the process is known as the greenhouse effect. Since the year 1900 the CO_2 content has increased by 12 per cent and many scientists are becoming alarmed at the trend if this is allowed to

Left: Tyrannosaurs Rex *snarls defiance as a huge fireball streaks through the upper atmosphere. Already shockwaves whip vegetation and cause the ground to shake. Soon only his fossilized bones will remain. (From the private collection of Donald R Brady Jr.)*

Above: A cometary nucleus passes high above the north pole of Saturn; the famous rings are in shadow. The ices of which the comet is chiefly composed have been melted and volatized during its last close-approach to the Sun, but have now frozen as hard as rock. Will it be deflected towards Earth? (From the private collection of Mrs B Evans.)

continue.

In another 60 years the global temperature could increase by 2-3°C, producing drought in grain-producing areas such as America's Mid-West, while elsewhere ocean levels would rise due to melting ice. Storm surges could flood major cities (making the Thames Barrier timely). Only an immediate reduction in the use of fossil fuels for heating and industrial processes can alleviate this problem; but vested interests such as the coal industry make governmental decisions of this type unpopular, while the alternative of nuclear power is no more attractive to many people. The only form of energy to make use of radiation which would have reached Earth anyway is 'renewable' (ie solar power), but too little research or capital has been put into this as yet.

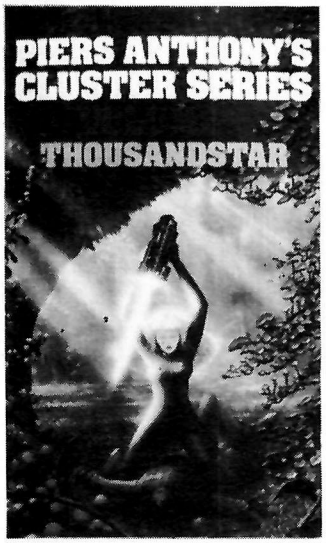
Meanwhile, Man has the ability to precipitate a disaster which could make all those yet described redundant. Those nuclear warheads which would destroy our hypothetical asteroid already hang (metaphorically, at least) over the heads of all of us. Enough of them, between the USA and the USSR, to equal one million Hiroshimas – that's 13 000 megatons – despite the fact that there are fewer than 3000 cities on Earth with populations of over 100 000. There is no need to dwell here on the obvious insanity of this, but what is relevant is that, as Carl Sagan and his team have pointed out, the effects of a nuclear war would be much worse and much wider than has been previously thought; they would in fact be very similar in many ways to the Cretaceous Extinctions.

High-yield airbursts would convert nitrogen into its oxides; apart from producing acid rain, these would combine with the ozone in the stratosphere, destroying the protective layer which prevents deadly ultra-violet radiation from reaching the surface. The vast quantities of dustlike soil particles lifted into the atmosphere (100 000 tons for each megaton exploded in a surface burst) and the smoke and soot from burning cities and forests would reduce sunlight at the ground to only a few per cent of normal. It would be darker than a heavy overcast, and photosynthesis would cease, for weeks at least.

This computer model was based on a 5000-megaton war with 'only' 20 per cent of weapons exploded at urban or industrial targets. Later the team found that even a 100-megaton war would produce effects almost as bad. They also discovered with mounting horror that the other result of this dust and smoke would be a reduction of land temperatures – to an astounding minus 25°C (–13°F). It would remain below freezing for months, even in summer, though the oceans would not freeze. But all farm animals and crops would die, at least in the Northern Hemisphere, as would other vegetation and wildlife. Most human survivors would simply starve; if they did not, 'intermediate' fallout from the upper atmosphere (usually ignored) would affect them. And – just as happens with dust-storms on Mars – the heating of the vast quantities of dust etc in northern mid-latitudes will transport them across the Equator and into the Southern Hemisphere. Even New Zealand will not be the haven once believed.

These results have been examined by over 100 scientists in the USA, Europe and the Soviet Union, and while details may be contested, the overall conclusions are agreed upon. There could even be other adverse effects, as yet unrecognised. Only pressure on politicians can lift this horrific prospect from us. It is no use burying our heads in the sand until they are buried in fallout.

READ OUT



'Thousandstar' by Piers Anthony. Fourth in the Cluster Series. Published by Granada at £1.95. Soft covers

Coming into a series of books (and why is it, it seems that every SF writer pens a series rather than just one book these days. These three – four – five or more series are breeding like Tribbles!) always fills me with doubts. SF books can be tricky at the best of times – all those alien life forms and names to get the hang of as well as following the story. So with a series the danger is that the reader will be left floundering, lost in the author's universe.

But no problem with this book. Volume Four it might be, but it stands up happily as a story on its own, even though the theme of taking a person's mind and shoving it into another being takes a while to get the hang of, and the book does jump from planet to planet a bit at the beginning.

Ultimately though, 'Thousandstar' is a variation on the theme of boy-being meets girl-being (though they can't kiss – she's in his body . . .) WG

'Dr Who – The Key To Time' by Peter Haining. Published by W. H. Allen at £12.50. Hard Covers.

And so it is '21 today', or rather in just under a fortnight for the six-faced Doctor, and this handsome publication marks the event with a diary record of the making of the programme from its, and the Dalek's, genesis, right up to date.

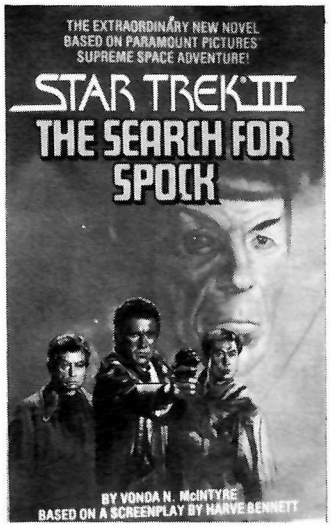
It is packed with delightful trivia – I mean did *you* know that the Beatles once made a fleeting appearance? And illustrated throughout both with stills (black and white and colour) from way back to present, plus many examples of artwork done by fans.

I spotted only one clanger – Colin Baker's *Blake's 7* part names him as Babon the Berserker instead of Bayban, and it is a shame that there is at least one mistake, because it makes one mistrust the rest of the work – all of 246 pages – as an accurate reference guide, especially when it is a reference only a little more than a year old, and easily checked.

None the less I very much enjoyed reading through *Dr Who's* diary, as it might be termed, and it was a lovely way of bringing many of the old stories back to me.

This lavish book will surely feature on many 'Whovian' Christmas present lists – if they can wait that long!

WG


THE EXTRAORDINARY NEW NOVEL
BASED ON PARAMOUNT PICTURES'
SUPREME SPACE ADVENTURE!
STAR TREK III
THE SEARCH FOR SPOCK
BY VONDA N. McINTYRE
BASED ON A SCREENPLAY BY HARVE BENNETT

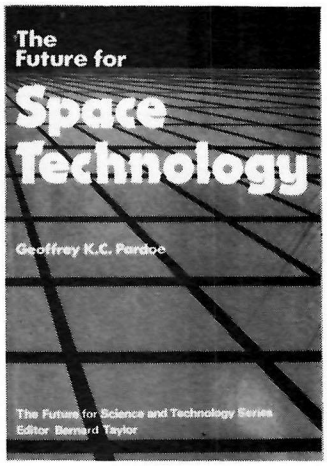
'Star Trek III – The Search for Spock' by Vonda N McIntyre. Published by Granada at £1.95. Soft covers

This is the one which must have been pounced on by *Star Trek* fans the moment it hit the bookshops, given the straggling distribution of the film in this country.

Everyone wanted to find out about Spock and all the other rumours and since many fans couldn't find out without travelling miles to London or a few other cinemas to see the film through the summer, this was the way to do it.

The book is all one expects from a novelisation of a film, with all the extra bits added to the story to make it flow – and, dare one say, turn the short story typescript of a film into a full-length novel. But I'm always left wondering, after reading such a work, how much of the extra was in the script and ended up on the cutting room floor – and how much is the writer's own imagination?

One thing which annoys me about the book is that Ms McIntyre has worked details from her own *Star Trek* universe, as established in her previous novels. WG



'The Future for Space Technology' by Geoffrey K C Pardoe. Part of the Future for Science and Technology series, edited by Bernard Taylor. Published by Francis Pinter at £14.95. Hard Covers.

This book was nothing short of a massive disappointment for me. I expected something really exciting and informative from the author, who is well-known as a space commentator on TV. But the book is muddled and scrappy.

For a start I was surprised to find that for a book about the future of space technology, a sizeable chunk at the beginning deals with the history of it all, and then moves on.

But worse: There are errors of fact. I was amazed to see on page 125 the British Interplanetary Society's work on living in space dismissed in a sentence as having been done 'earlier this century' when I thought it was in the 70s that the society did its Daedalus work.

The book is written very much from the author's own viewpoint, with plenty of mentions of projects in which he has been involved. But much of the information is scrappy. A fine colour illustration is captioned 'Remotely sensed data from space used for pollution monitoring.' Fine – but where? What sort of pollution? How is it judged to be pollution?

All in all, the book tends to blind the reader with very technical data but neglects to explain the basic hows and whys of it all. A pity. It should have been an interesting book. WG

'Chekhov's Journey' by Ian Watson. Published by Granada at £1.95. Soft covers

Mixed feelings on this one. The idea for the novel is superb, with an amazingly convoluted plot, and tremendous knowledge of the subject and background research are evident – at least I think they are, for I'm not really that knowledgeable about Anton Chekhov nor just pre-revolution Russia, but it all sounded authentic.

The tale is one of tangled time with tracks running between present, past and future, but the reading of it got a bit confused at times. I'm afraid I don't like a book where you keep having to stop and re-cap where – or in this case – when you are, if you get distracted for a second and this is what happened, especially as the action jumped between the three times continually. WG

'The History of the Runestaff' collection of four Runestaff novels by Michael Moorcock. Published by Granada at £2.95. Soft covers

At 573 pages the first thing which has to be said about this publication is that it is really smashing value, just the thing to pack for a holiday, and it will keep you engrossed for quite a while – very satisfying for a speedy reader like myself who can usually zip through an average paperback in two or three hours and then starts looking for something else to read.

It is also extremely gratifying, I would imagine, to be able to read the whole story, rather than piecemeal as each one was published. I confess I do have doubts about these planned-as-three-of-four-book sagas which seem to be in vogue for SF and fantasy books at present. I wish authors and publishers would wait and publish in one large volume, though I suppose there's not so much profit.

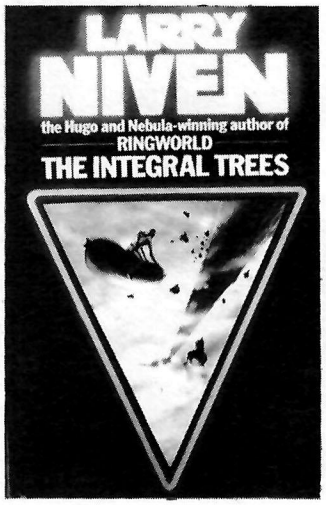
The History of the Runestaff is a fantasy saga which I enjoyed very much, though towards the end I realised why so much of it seemed vaguely familiar – in a way it reminded me of *Blake's 7* – (sorry

Michael Moorcock). The hero, Hawkmoon, it has to be said, is a bit thick for all his prowess with the sword, prowess he is forced to polish every few pages as he gets into a fight against the evil Emperor's troops. They're like Federation troops too – Hawkmoon regularly defeats them with odds of about 600 to 1 against. Hawkmoon is Blake. The Warrier in Jet and Gold has his equivalent in Avon (both right know-alls) and there's even a Vila – D'Averc, whose always ill. The story proceeds through four books (four seasons . . .) with them causing the evil Empire no end of trouble and winning till half of the band get killed in the last few pages. No comment.

There's fun too in finding out just where the author concocted some of his names – how'd you like Jhone, Jhorg, Phowl and Rhunga as terrifying ancient gods, said to rule the land before the Tragic Millenium . . .

All this might lead you to think I didn't like the book. Wrong. I did. It kept me awake and reading some nights into the early hours.

I recommend it as worth a read – and if you don't agree, it is large and heavy enough to use afterwards as a doorstop! WG



'The Integral Trees' by Larry Niven. Published by Macdonald at £8.95. Hardback.

Right from the start this book takes you into the higher fields of geometry, for the characters live in a tree floating in a gas torus. The concept is so strange that four diagrams are needed at the beginning and even then I'm not sure I got the hang of it all.

That notwithstanding I enjoyed Integral Trees. It is very much an SF book with strangely developed and mutated humans living in strange environments, coping with strange things. Even so, it is very much still a story of the human spirit and its refusal to submit to slavery in any form, however sugared be the pill. Also there is Man's curiosity and courage.

Lurking in sinister fashion behind all this is the shadow of Earth, and hints of the culture prevailing there and Hugo-winner Niven hits the reader right between the eyes with his last few words on how the characters or their descendants will fare. This book does not have a happy ending.

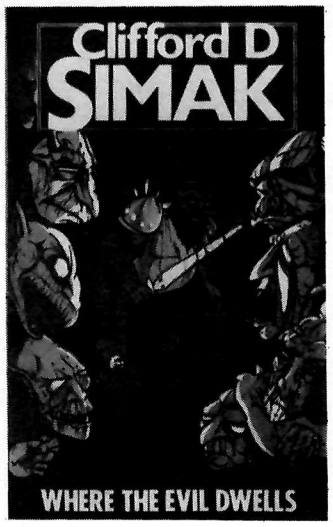
Only one question remained – and it is one which has often puzzled me regarding any books where humans – or other beings for that matter – have been abandoned or cut off from their parent culture.

Is it really likely that beings which had the knowledge and intelligence to travel the stars would promptly forget all that knowledge – turning always to a tribal culture with – surprise – a medicine man who has garbelled access to the old knowledge. I have my doubts. WG

'Where the Evil Dwells' by Clifford D Simak. Published by Severn House at £7.95. Hardback.

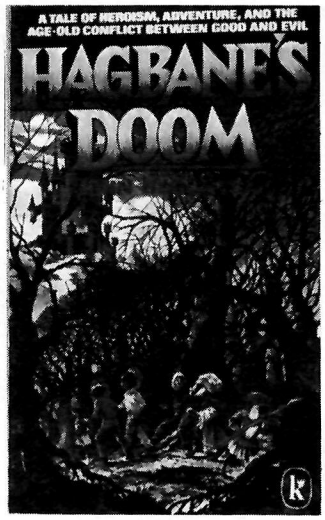
This is more of a fantasy than an SF story, set on Earth, in the days of the Roman Empire, but it is a very different, though Feudal land, in which one can glance at a dragon in the sky as easily as you or I might see a blackbird.

All the supernatural beings of this world are part of an Evil nation, which lives in the Empty Land, periodically bursting forth to do battle. The story is of a small band who venture into the Empty Land, the Abbott to retrieve a prism in which is trapped the soul of a Saint, and a young lord who wishes to rescue his lost love.



All the Ogres, Fairies, Harpies and Trolls (bar one who has lost his bridge home) seem against them and also seem to be thoroughly nasty beings – I always thought fairies were pretty friendly, if inclined to mischief.

It's a good adventure tale, plenty of battles, and the odd magic fix thrown in when the odds seem against the intrepid band. WG



'Hagbane's Doom' by John Houghton. Published by Kingsway at £1.95. Soft cover.

A first novel that promises us a writer who knows his way around an idea and how to execute that idea. This is a story that is more than a fantasy/adventure for children which the cover may lead you to believe. Granted, most of the characters are animals, but the interaction of human and animal personalities draw your attention to the conflict and into the planning and plotting of each side. Intermixed with the action are moments of quiet, moments of one character expressing care and understanding to another, bringing the reader even more into the progression of the story.

Many authors seem to write their characters into situations where there is only one way out, (most of us figure it out before the end) but John Houghton's style of writing left the plot with more than one direction to go, which I felt a refreshing change.

This book has the same feeling of warmth and charm that I felt from 'The Railway Children' and 'The Borrowers' and more than likely I will read 'Hagbane's Doom' again.

This story was fun to read, it wasn't puff and fluff but a well thought-out romp in fantasy. MF

'Asimov on Science Fiction' by Isaac Asimov. Published by Granada at £2.50. Soft covers

This is yet another of the collected writings of the 'Good Doctor', loosely under the banner of his thoughts on SF. While his knowledge of SF cannot be argued, since his first of goodness-knows how many hundred appearances in print was in 1939, so many of the short essays overlapped in information that I felt towards the end I would scream if for example once more John Campbell of Astounding Science Fiction Magazine was mentioned, however laudable it might be to pay homage to one's mentor, and the patron of many a successful SF writer.

It is a shame that this is such a bitty book. Given Asimov's undoubted skill in writing both informatively and with a light personal and humorous touch when he is penning anecdote or fact it is a great shame that he didn't sit down to write down all his memories from about 50 years of SF as a proper work. As a personalised history of modern SF it would have made a fascinating read as well as being a contribution to the record-keeping of the genre. So many of the early magazines have been lost, or are tucked away that much of the writing has been all but lost, along with the writers, but how much of that is tucked away in Dr Asimov's memory.

Magazines come and go, but books usually go on for ever. Dear Doctor, please write the book! WG

Reviewers this month
JB – Jane Bannister
DB – Darren Butterworth
MF – Mils Fabricus
HH – Henry Horsfall
WG – Wendy Graham
CR – Chris Richmond

The Lizards Return

IT WAS A CLOSE THING BUT WE ON EARTH SENT THOSE LIZARDS PACKING. . .DIDN'T WE? OR DID WE? THIS SUMMER'S DROUGHT NOTWITHSTANDING, IT SEEMS IT ALL WASN'T AS FINAL AS WE THOUGHT, FOR *V* WILL BE BACK ON OUR SCREENS EARLY NEXT YEAR WITH A NEW SERIES. JOHN PEEL REPORTS.

On October 26, the Visitors will return to NBC network in the USA, making their third appearance, this time in 13 hour-long episodes due to appear on British television in the New Year.

In December, *V: The Comic Book* will appear on news-stands in America, courtesy of DC Comics, who publish the more traditional *Superman*.

In September, a series of the original novels based on *V* began to appear with *V: The East Coast Battle*, written by A C Crispin and Howard Weinstein. Five more are planned at monthly intervals from Pinnacle Books.

The Visitors have returned, with top ratings and high sales figures!

What's it all about? Back on May 1, 1983, NBC launched a two-part, four-hour mini-series called, simply, *V*. It was the latest in a line of science fiction oriented media events, and one that few people really expected to do too well. SF on TV traditionally does not succeed – the audience is simply too limited, and the treatments too simple. Even the much-vaunted *Star Trek* had dreadful ratings, and only properly prospered when it went into syndication. For the 1982-83 season, NBC had tried an interesting series called *Voyagers!*, an sf concept of time travellers putting history back on the path that history books record when it strays a little. Ratings were very poor, and after 20 episodes, it faded into TV limbo.

The risk of spending a lot of money on the four-hour mini-series seemed great, but producer Kenneth Johnson had faith that it would work. Johnson, better known for *The Incredible Hulk* and *The Bionic Woman*, can hardly be said to have a strong science fiction background. But part of the appeal of the show

traditional sf mould.

'I really started out to do a piece about how Americans would react to occupation by a foreign power,' Johnson revealed. 'I couldn't come up with a human army with enough staying power.' He had considered first having either the Russians or the Chinese conquer the country, but decided that aliens were far more plausible!

This is the basis where the show really works. The concept of alien invaders has had a very mediocre response in the past. Roy Thinnes' *The Invaders* managed to last two seasons, but he was one man fighting a war against hidden invaders. Britain's Gerry Anderson gave us *UFO*, this time with a secret organisation fighting hidden aliens. Both shows missed the primary appeal that *V* managed to catch: neither had believable characters. Thinnes was a kind of paranoid character, running about like a lunatic, trying to convince people that something was going on. Anderson's were – pardon the expression – wooden; they were not people you could either like or sympathise with.

V approached the problem the reverse way about: it had to be real. 'I was anxious for the story to parallel events that have taken place in our own history,' Johnson explained. 'I focused on the way the Third Reich, came to dominate France and the Scandinavian countries in particular. The experience of the Jews translates in *V* into the persecution of scientists.'

Having a firm ground in history, Johnson then moved into his characters. They are real, almost soap-opera in their complexity. Hero Donovan (Marc Singer) has an ex-wife who left him because she couldn't compete with his popularity with their son; his lover turns traitor and becomes the Visitors' press secretary; his best friend is captured and tortured to death by the aliens. He is a loner, who is caught up in something you can't be alone in. Heroine Julie (Faye Grant) loses her lover because she is a hated scientist, and he can't get work. She is crippled in a fight with the Visitors, and has to lead the resistance, when she is filled with doubts and plagued with worries. They aren't tough to start with, but they learn.

This is matched by all of the other characters – they rapidly become very three-dimensional, and we start to care for them. There's the father, whose daughter is captured by the aliens, and has to betray his friends to try and save her; the girl (Blair Tefkin) who becomes subject to a frightening experiment, and carries an alien baby; and a streetwise kid whose brother is killed fighting back . . .

Then there is the other side – Donovan's mother, who co-operates with the aliens, because she is a survivor and she is convinced that only by working with them, however evil they may be, will she win through, or the creepy maladjusted Daniel, who sees the Visitors as his only chance to be someone. As in any take-over there are always those who see ways to turn things to their own advantage.

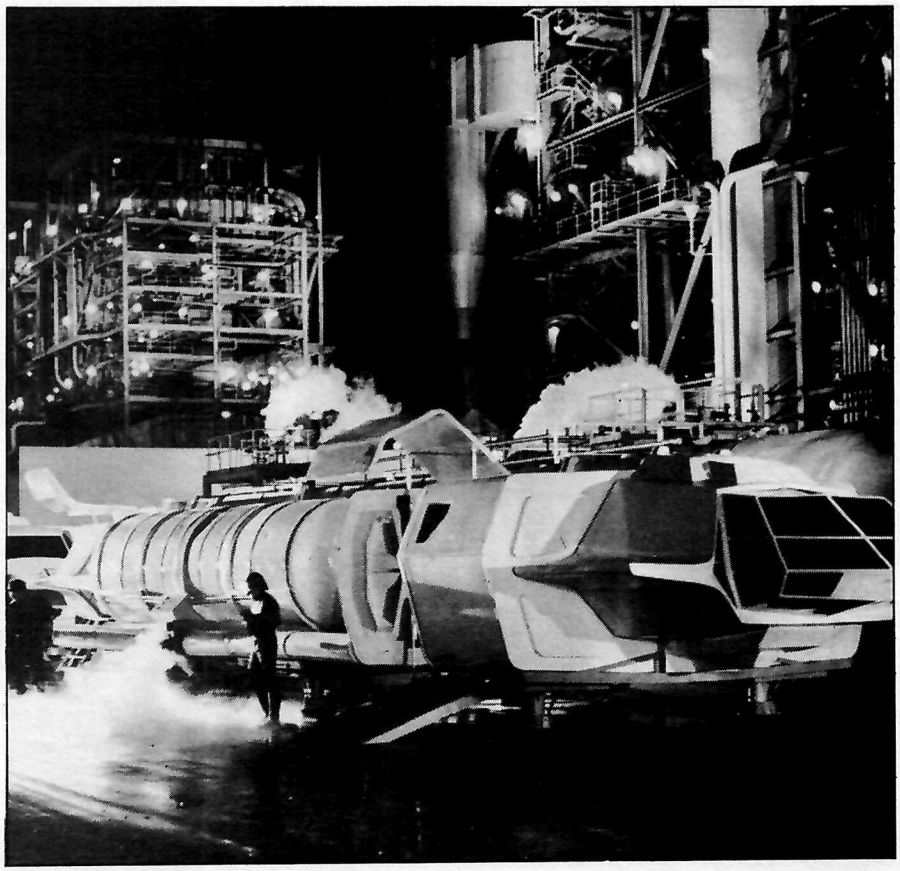
Many of the plot devices are straight from the soap operas, and with them the writers

make the whole story believable. You get to like characters, and then to care about them. This hooks you to the storyline, and in an odd way, Johnson is right – the aliens become almost incidental.

The Visitors themselves are, like the humans, real and with their own ideas and problems – and they cannot all agree amongst themselves as to the course of action to take. They have been sent to Earth by their despotic leader to plunder the water that they need, and the humans whom they can use for food, neither of which really bears up under scrutiny. They could manufacture water from interstellar hydrogen and any oxide compounds far simpler than coming all the way from a planet about Sirius to Earth. And they could breed food animals far more easily than building cryogenic carriers to take millions of half-dead bodies back home with them.

They are really lizards, of course, but disguise themselves as humanoids in order to back up their pleas of friendship. One of the

"V" – Kristine (JENNY SULLIVAN) discovers humans placed in gelatinous cocoons in a state of suspended animation, to be used as food for the aliens. From Warner Bros. Television Distribution. Printed in U.S.A.



"V" – Alien ships prepare to transport chemicals to a mother ship. From Warner Bros. Television Distribution. Printed in U.S.A.

"V" – One of the mother ships over Los Angeles as the aliens arrive on planet Earth. From Warner Bros. Television Distribution. Printed in U.S.A.

highlights of the story was when Donovan ripped at the face of an alien, and skin came off to reveal the glistening hide of scales beneath

Responsible for achieving such difficult shots that had to stand up visually was veteran make-up man Leo Lotito, who numbers *Planet Of The Apes* among his many credits. Each actor in *V* who had to turn into a lizard worked with Leo and his team on an individual mask. When the facial features were judged correct, a latex mask was applied to the actor of the lizard skin, then a second with his normal features on it. This was a complex process, taking over two hours to apply, and it had to look perfect. Of course, the make-up was only part of the problem, because the crisis came when the face mask had to be ripped off, and the underlying lizard mask had to stay perfectly in place. Thankfully, in the filming, not one time did the lizard mask rip off as well.

Another 'alien' sequence that hooked everyone is the rodent-swallowing. Diana (Jane Badler) even 'swallowed' a guinea pig, no mean achievement! Her jaw appeared to stretch to take the creature, and her throat to ripple as she ate it. In fact, the face that ate the poor thing was actually a latex mask over a mechanism built to simulate a human head – it could even blink the mask's eyelids. Lotito and his team then fitted an appliance onto Jane Badler from her chin down to her breast bone, which housed three air bladders. Operated by compressed air, and controlled remotely, these were inflated to create the illusion that Jane was swallowing the guinea pig.

Crucial as the effects are, Johnson stresses, 'The heart of the piece is the indomitability of the human spirit, the fact that when they are trampled into the ground by a Hitler or the Visitors, people will rise up and strike back.'

Of course, all the Visitors have their own personalities, so we feel that we can get to know them too. They are suprisingly just like us in many ways, though they can stand extreme cold (but not warmth), and their eyes are more sensitive to light. Diana is the arch-villainess, the real nasty of the piece. Once a lover of the Leader (do reptiles take lovers?), she is sent to Earth partly to get her out of his way. She seems very strange, with her paranoia, her brilliance, her experimentation. Diana is a very complex character, and the only bad alien to survive the mini-series.

At least ostensibly in charge, John is the Supreme Commander, and played by TV veteran Richard Herd. Herd is a regular on *Falcon Crest* (an evening soap opera) and *TJ Hooker*. In an interview for *Space Voyager*, Herd spoke enthusiastically of his role.

'Well, there's no doubt about it, John thinks he's a good guy. But in actuality, he is a despicable human being, of course. We have a lot of fun on the set. I mean, we're all down there, cast and crew, doing all these weird lizard jokes and puns. For instance, we hum 'I've got a crush on you', and my particular favourite is 'The Wonderful Lizard Of Oz', he said.

'I'm have a lot of fun with it,' he confessed. 'There's a lot of camp and lightness, even though it's a very heavy subject, and it gives a lot of opportunities that are unpredictable.'

The opportunistic Steven is constantly scheming to replace Diana, and snipes at her continually, undermining her authority. Martin, Diana's right-hand man – er . . . lizard – is in reality a sympathiser with the humans, but needs Donovan's constant push to keep him moving. He is running scared, as so many of us would be in his position.

Everyone's favourite alien, though, is poor Willie. He is a misfit, by all standards, but brave and loyal, and with a heart. Teamed with the human, Harmony, he is a very sympathetic and realistic character. One of the best parts of the second installment in the series is when he is captured by the resistance workers, who plan to experiment on him. There can't have been many people watching who didn't worry about what would happen to him . . .

Alien troops stand guard after imposing martial law on planet Earth. From Warner Bros. Television Distribution.

Main control room of the mother ship hovering over Los Angeles. From Warner Bros. Television Distribution.

Aliens arrive on planet Earth to begin their secret mission. From Warner Bros. Television Distribution.

V: The Final Battle

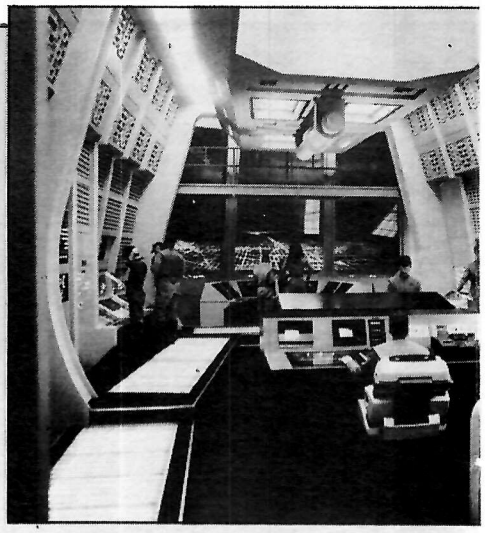
The first mini-series had tremendous ratings, and finished second only to a popular blooper show. There was some speculation that the event would be turned into a series, as NBC was doing very poorly in the ratings overall (their only hit was *The-A-Team*). Unfortunately, the special effects for the mini-series simply made it uneconomical to think about a weekly show: the budget would be prohibitive. What was planned instead was a sequel.

This time around, writing chores were handled by a number of writers, who would try and resolve a number of the important plot-points left hanging, and to end the tale of the invasion. *V: The Final Battle* was eventually a six-hour, three-part series, debuting May 6, 1984. Once again, it drew tremendous ratings, as everyone waited to see what the first human-alien baby would be like, who would live and who die, and how the renegades would get their just desserts.

All was handled beautifully, with the occasionally-heavy handed Nazi parallels of the first movie being toned down considerably to allow better plot development and resolutions. In many ways, the second set of episodes was better than the first. In one important way, especially, this was true: the effects had been done on a far cheaper basis this time around.

Handling the miniatures was Greg Jein, whose work has also appeared in *Dark Star* and *Close Encounters*. He had worked with his crew on the original series, constructing over thirty models for the effects shots, but when it came time to film *The Final Battle*, there were less than twenty left. The others, mysteriously, had disappeared.

'Unfortunately,' Jein said, 'one of them was one of the key models for the second season. That was the tanker ship which was only used for one shot in the first part. We had two weeks to build a new tanker ship which took about four weeks originally.' The tanker ship was basically similar to the huge mother ships used to float over the cities, but it had a lot of extra 'plumbing' to make its purpose more obvious.



The model work was done fast, and done a little more cheaply than in the first mini-series. With the success of the second mini-series (which beat the star-studded but terrible *The Last Days Of Pompeii* by a huge lead in the ratings), this time around it was seriously in the air that NBC would order a series. NBC executives decided to give the project the go-ahead, and 13 episodes have been commissioned.

V: The Series

Series Co-producer Dan Blatt, claims it will be 'probably the most expensive show on television', since each episode will have a budget of over $1 million (some films can be made for less!). 'No more Mr Nice Guy', Blatt promises of the alien return.

Many of the stars of the mini-series will return. Marc Singer has been signed on to play Donovan once again. Singer has been seen in

Beastmaster and *If You Could See What I Hear*. Born in Vancouver, he is very pleased with reaction to *V*. Over the summer, he has been shooting a guest spot on *The Love Boat*.

Back also is Jane Badler, who plays Diana, chief villainess of the Visitors, and the only baddie to survive the battle. She will, however, still not be in a position of supreme power, as the aliens have a new leader, Lydia, played by newcomer June Chadwick. June has appeared in *This Is Spinal Tap* and as a guest on a number of shows, including *Magnum, PI*. We can doubt if Diana will appreciate this arrangement!

Faye Grant is back as the lovely, spirited leader of the Resistance, Julie. Both Julie and Marc are now going to be leaders in a world recovering from the aborted invasion attempt. In the mini-series, many of the world's leaders had been conditioned by the aliens, and now the Resistance fighters are having to prepare the Earth for the return battle.

A new resistance fighter will be Kyle Bates, played by Jeff Yagher, in his first TV role. He will be a young man fighting alongside the rest of the force.

Elizabeth, the half-human/half alien will be back, and the producers are planning to explore her strange character more fully this time around, and promise surprises there. Back also is that lovable alien, Willie.

V: The Comic Book

Alongside this will be DC Comics' version of *V*. This will be a monthly comic, written by Cary Bates, perhaps best known for his writing work on *Superman*. The comic will include characters from the show, plus new ones created for the magazine. Artist will be Carmine Infantion, a veteran penciller of *Adam Strange* and *The Flash*, with Tony DeZuniga as inker. Editors are Marv Wolfman and Bob Greenberger.

V: The Novels

At the same time as the series hits the screen, Pinnacle Books will be releasing their series of original novels. They issued A C Crispin's version of the two mini-series, which shot into the best-seller lists when it came out.

First volume in the six-book series is *V: East Coast Crisis*, written by Crispin and Howard Weinstein. This book is set in New York, and takes place at the same time as the events in both series of *V*. Next scheduled is a December release called *The Pursuit Of Diana*, beginning a regular series of books.

All in all, it looks as if the Visitors have arrived in force. Whether they can keep their high ratings remains to be seen, but indications are very good at the moment that this will happen. Certainly the show is one of the few genuine sf series that seems to have caught a wider market. And that it itself is no mean feat.

GETTING THE PIPS

LAST MONTH SAW THE CENTENARY OF AN INVISIBLE LINE WHICH MAKES POSSIBLE ACCURATE LAND, SEA AND STELLAR NAVIGATION AND TIMEKEEPING. WHAT IS THIS LINE AND WHY IS IT SO IMPORTANT? WENDY GRAHAM STEERS YOU ROUND THE ANSWERS.

'Time is relative – lunchtime doubly so' and as I write this my time, relative to London readers, is minus 12 minutes Solar time. That I can look at a watch or clock and see the same time as every other British reader of *Space Voyager* is due to one thing – Greenwich Mean Time – the time standard for the world, calculated from Solar Time at the Old Royal Observatory, Greenwich Park, London.

This imaginary line, drawn from pole to pole through Greenwich celebrated its centenary last month. It was fixed at an international conference in Washington in 1884 to resolve the time and navigational chaos which came from different countries using Greenwich, Paris, Cadiz, Naples, Pulkova, Stockholm and many other cities as their zero base.

Delegates from 25 counties met at Washington, and after adopting unanimously the desirability of using one line proceeded (naturally) to wrangle about which one. The American delegates proposed that Greenwich be the standard, while the French suggested a neutral line. Two arguments ran counter to this latter idea – firstly that the line would have to pass through a scientific observatory and secondly that such a line would mean that everyone would have to change.

Greenwich was shown to be used by 65 per cent of all shipping and the remaining 35 per cent used over ten different meridians.

Finally the Meridian was fixed as the line passing through the centre of the transit instrument at the Observatory in Greenwich. 22 Countries were in favour, San Domingo against and France and Brazil abstained.

After 1884 shipping changed over but more importantly for most of the world's population was the adoption of a time zone system based on the Meridian. Countries quick to adopt this included Japan, Italy, Germany, Australia and New Zealand. Others took a little longer – Liberia only switched in 1972, while until 1978 France kept 'Paris Mean Time, retarded by 9 minutes 21 seconds' (which happens to be within one fifth of a second of GMT . . .)

In Britain uniform time for the whole country came in 1880 by Act of Parliament, after railway travellers had rebelled against the confusion of having to re-set watches as they travelled East-West.

World's first time signed

Distributing the time also started at Greenwich – in 1833 what is thought to be the World's first public time signal was started. A ball is still hoisted up a pole at 12.55 every day. At 12.58 it moves to the top and at precisely 13.00 it drops. The ball could easily be seen by ships on the Thames and in the Port of London so that mariners could take accurate time to sea and thereby fix their positions.

Charting the Meridian and therefore achieving a unified scheme for time-keeping round the world were two vital factors not only for mariners – and anyone arranging a meeting – but the skills they developed meant that accurate surveying and charting of the heavens became possible.

Much of the early work on mapping star positions and checking the accuracy of earth clocks against the accuracy of the Universe's clock was done on an instrument still in working order at Greenwich, Airy's Transit Circle. This telescope/instrument, built in 1850 and brought into operation a year later was last used in earnest in 1954, but has recently been refurbished and is still used for demonstration purposes.

From the development of the Meridian and

Where East meets West. The brass strip which marks the Greenwich Meridian in the courtyard of the Old Royal Observatory (Photo: © National Maritime Museum).

WITHERNSEA
Holmpton
Out Newton
Easington
Kilnsea
SPURN
GRIMSBY
CLEETHORPES
Humberston
Tetney
North Cotes
Marshchapel
North Thoresby
Fulstow
Grainthorpe
Cockerington
LOUTH
Grimoldby
Manby
HORNCASTLE
Stickney
Sibsey
Old Leake
Leake Common
Frithville
Wrangle
Benington
Butterwick
Freiston
BOSTON
Fishtoft
Skirbeck
Wyberton
Kirton
Frampton
Holbeach Marsh
Holbeach St Marks
Holbeach St Matthew
Holbeach Hurn
Holbeach Bank
Whaplode
Long Sutton
Sutton St James
Tydd St Mary
Tydd St Giles
Sutton St Edmund
Gorefield
Leverington
WISBECH
Wisbech St Mary
Walsoken
Guyhirn
Rings End
West Fen
MARCH
Wimblington
Doddington
CHATTERIS
Langwood Fen
Horseley Fen
Pidley Fen
Somersham
Oldhurst
Woodhurst
Earith
Hill Row
Willingham
Over
Swavesey
Rampton
Longstanton
Oakington
Westwick
Histon
Dry Drayton
CAMBRIDGE
Caxton
Bourn
Comberton
Kingston
Harlton
Harston
Hauxton
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Croydon
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Abington Pigotts
Kneesworth
Bassingbourn
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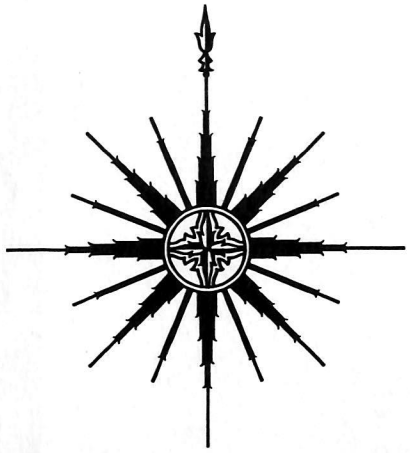


the means to calculate accurately the longitude grew another vital tool for the astronomer, the Astronomical Almanac.

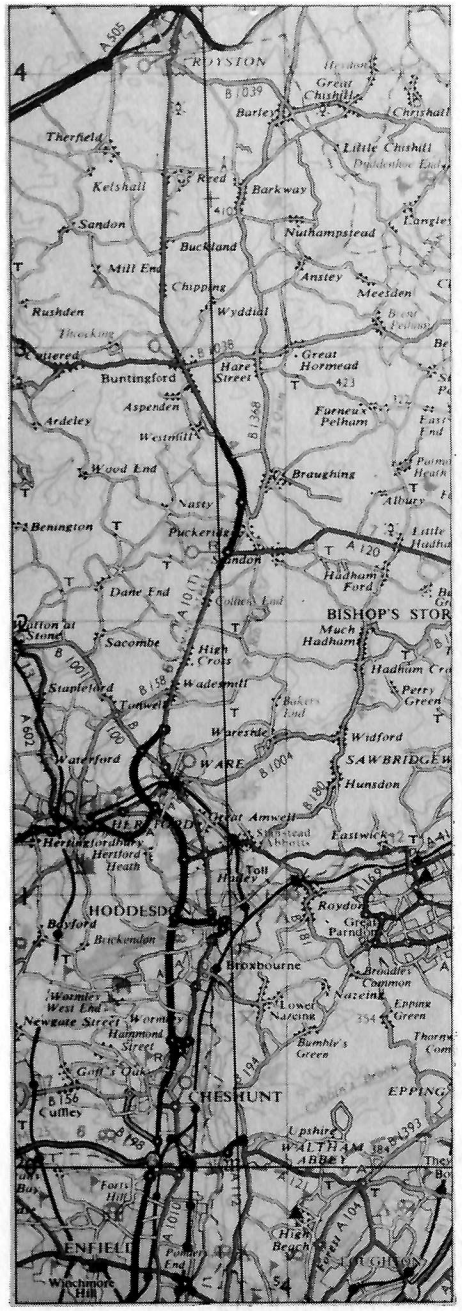
First published in 1766 by one Nevil Maskelyne it is still indispensible for navigators today, even though it has been described as 'Even more turgid reading than a telephone directory'.

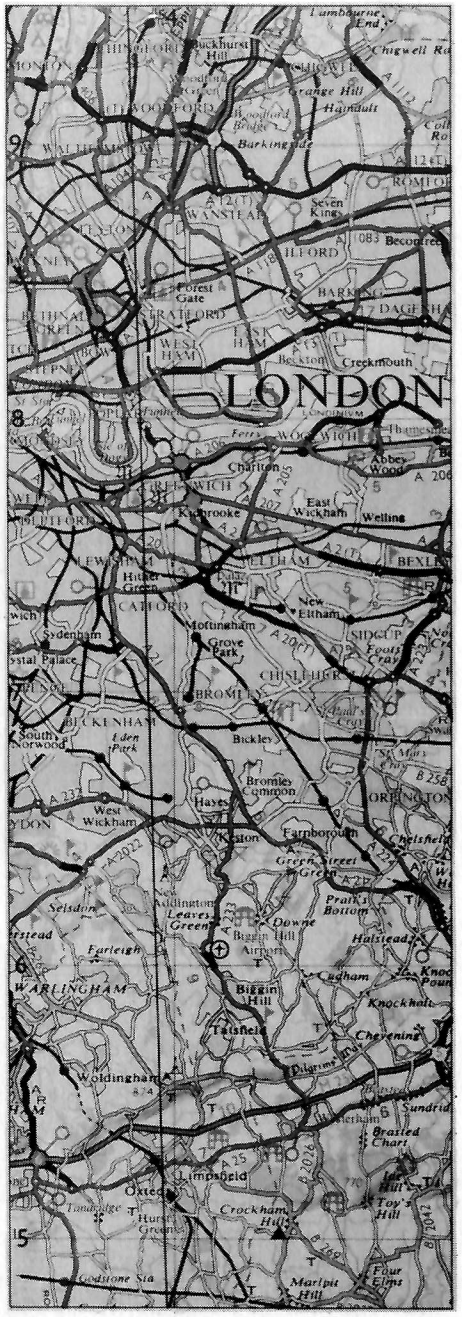
The publishing of the annual tables, showing which star or planet should be where and at what time, was and still is entrusted to the Royal Greenwich Observatory, who now work jointly with the US Naval Observatory on the preparation and publishing.

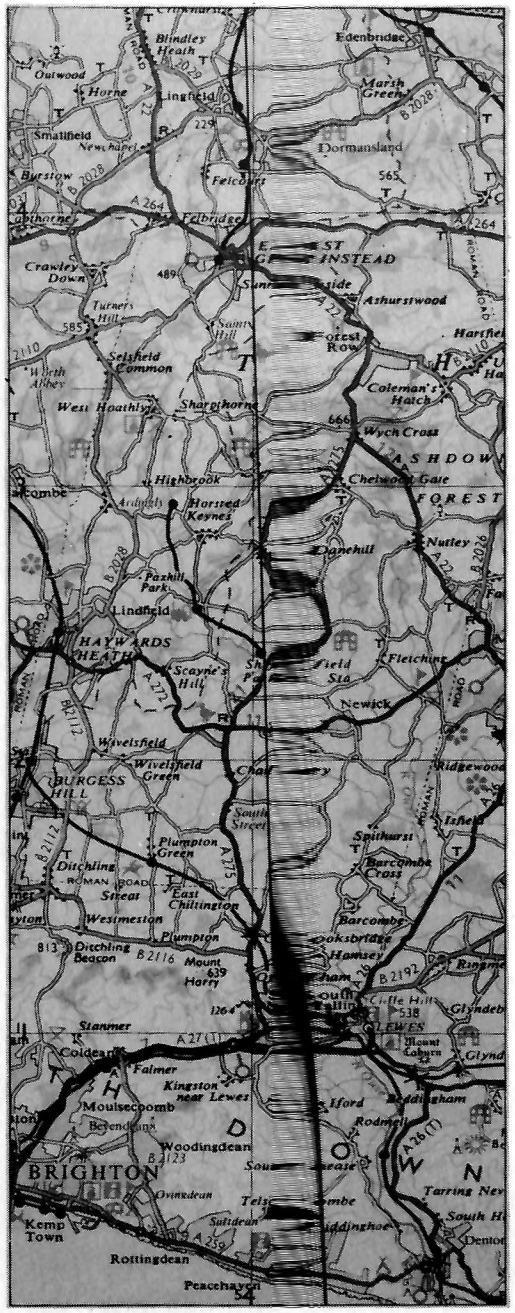
It contains detailed tables of the motions of the Sun, Moon, and planets, as well as information on stars, satellites and observatories.

Even today, with sophisticated satellites making navigation on land, sea and air and space easy almost to the point of push-a-button, these tables, and the old equipment of sextant, almanac and chronometer with accurate time are by no means obsolete. Computers can crash, electronic equipment can malfunction and radio beacons can be jammed but armed with the right equipment and knowledge, plus pencil and paper, man can still navigate.

From The Greenwich Meridian published by Ordnance Survey price £1.95.







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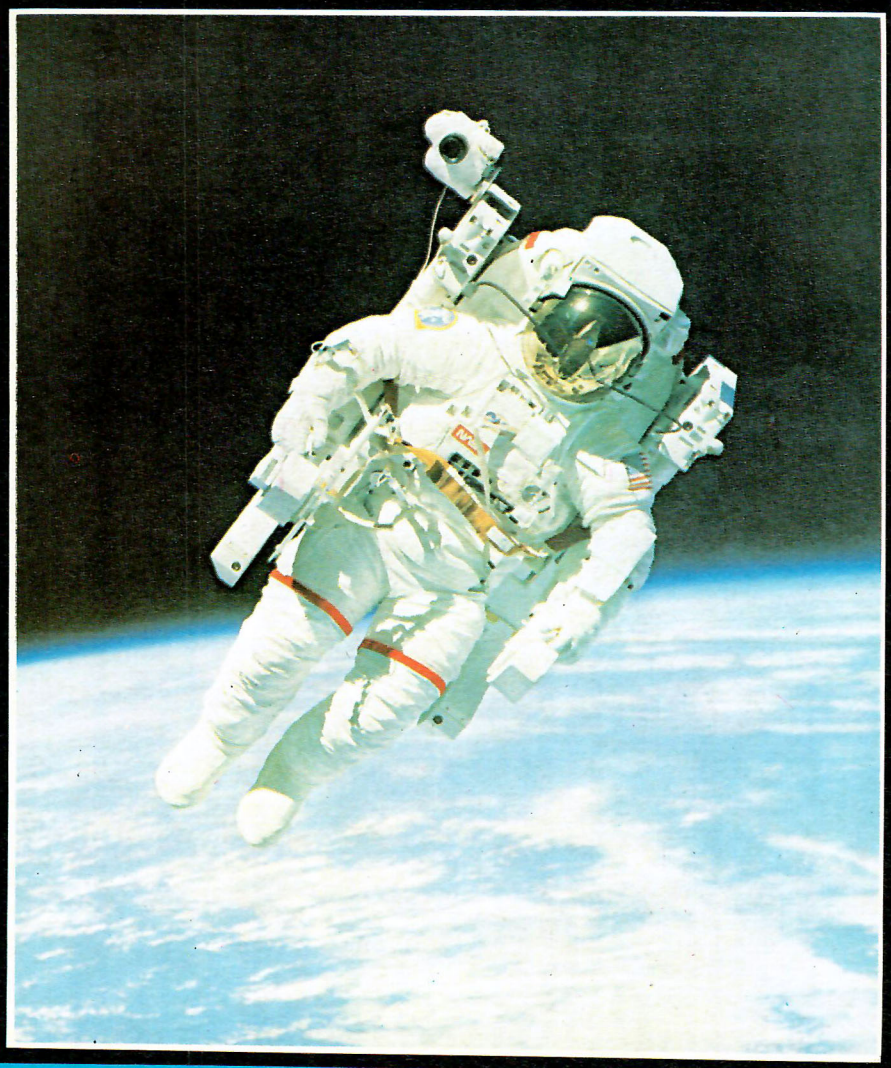


BOROUGH '84

EVERY TWO YEARS THE WORLD'S AEROSPACE COMPANIES DESCEND ON FARNBOROUGH IN HAMPSHIRE TO TRADE AND SHOW OFF THEIR WARES TO THE PUBLIC. FORMER *SPACE VOYAGER* CAPTAIN, IAN GRAHAM RESPONDED TO A CALL OUT OF FLEET RESERVE TO BEAM DOWN WITH HIS NOTEBOOK AND PENCIL AND REPORT.

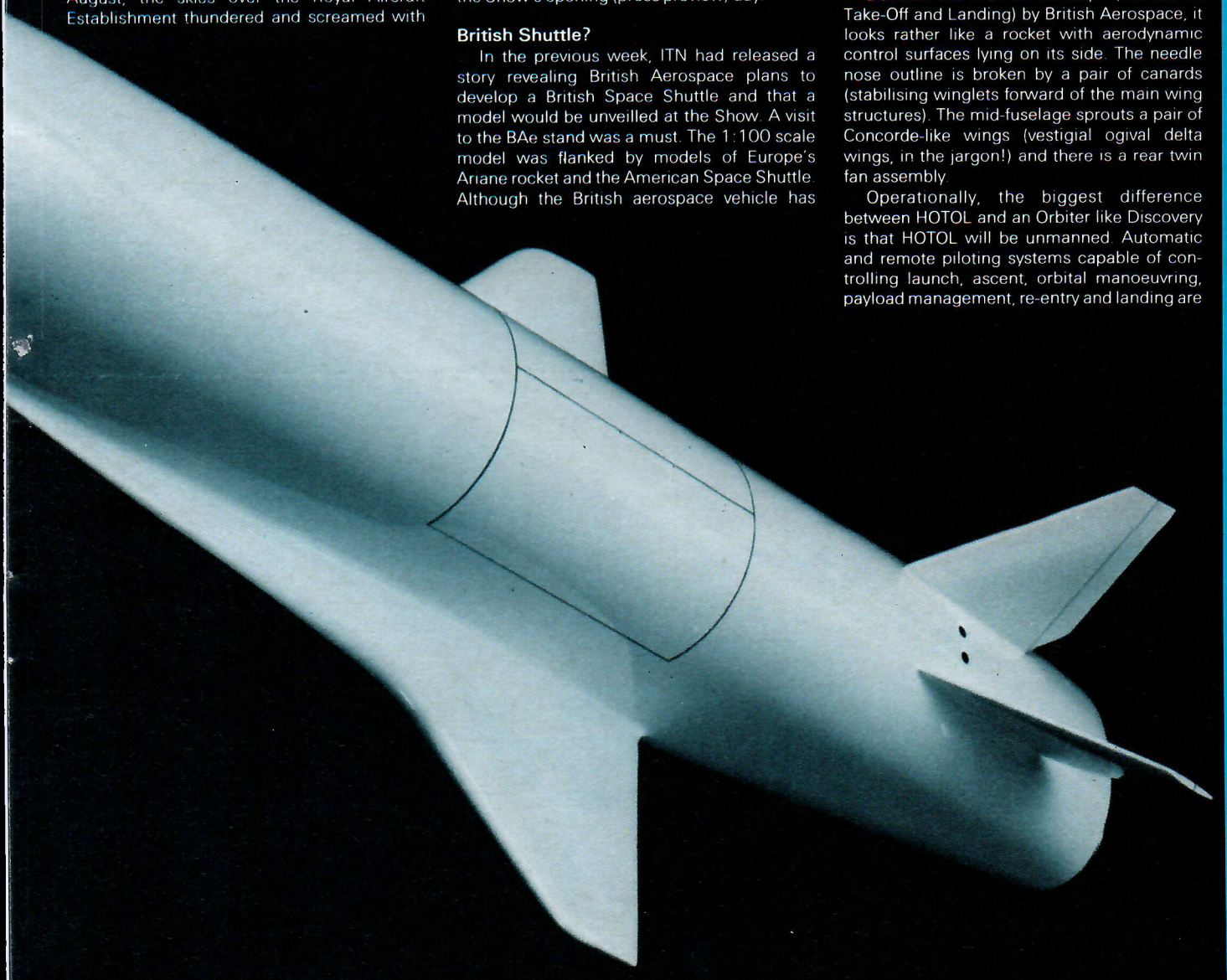
Amid optimistic reports of an upturn in the civil aviation market, the world's plane makers brought their wares to the Hampshire countryside for the 1984 Farnborough International Airshow. During the last week of August, the skies over the Royal Aircraft Establishment thundered and screamed with the unmistakable sounds of military jet-jocks rehearsing their party tricks for the Show proper, which ran from September 2 to 9. The elements treated the aviation press kindly – a hot Sun and blue skies greeted their arrival on the Show's opening (press preview) day.

British Shuttle?

In the previous week, ITN had released a story revealing British Aerospace plans to develop a British Space Shuttle and that a model would be unveilled at the Show. A visit to the BAe stand was a must. The 1:100 scale model was flanked by models of Europe's Ariane rocket and the American Space Shuttle. Although the British aerospace vehicle has been called a space shuttle in press reports, it bears little resemblance in either appearance or operation to NASA's growing fleet of Orbiters – Columbia, Challenger and Discovery.

Dubbed the HOTOL concept (HOrizontal Take-Off and Landing) by British Aerospace, it looks rather like a rocket with aerodynamic control surfaces lying on its side. The needle nose outline is broken by a pair of canards (stabilising winglets forward of the main wing structures). The mid-fuselage sprouts a pair of Concorde-like wings (vestigial ogival delta wings, in the jargon!) and there is a rear twin fan assembly.

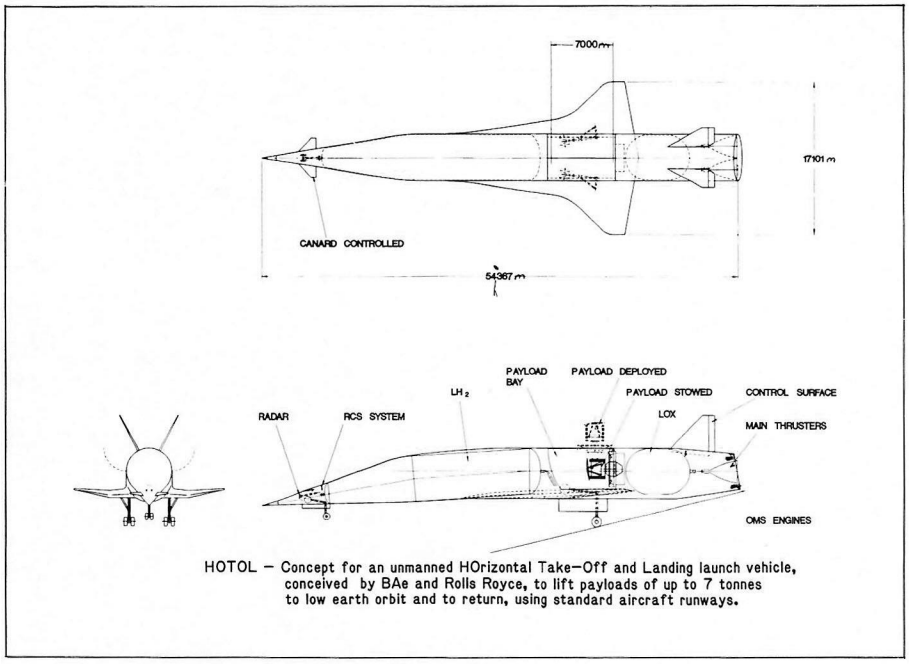
Operationally, the biggest difference between HOTOL and an Orbiter like Discovery is that HOTOL will be unmanned. Automatic and remote piloting systems capable of controlling launch, ascent, orbital manoeuvring, payload management, re-entry and landing are



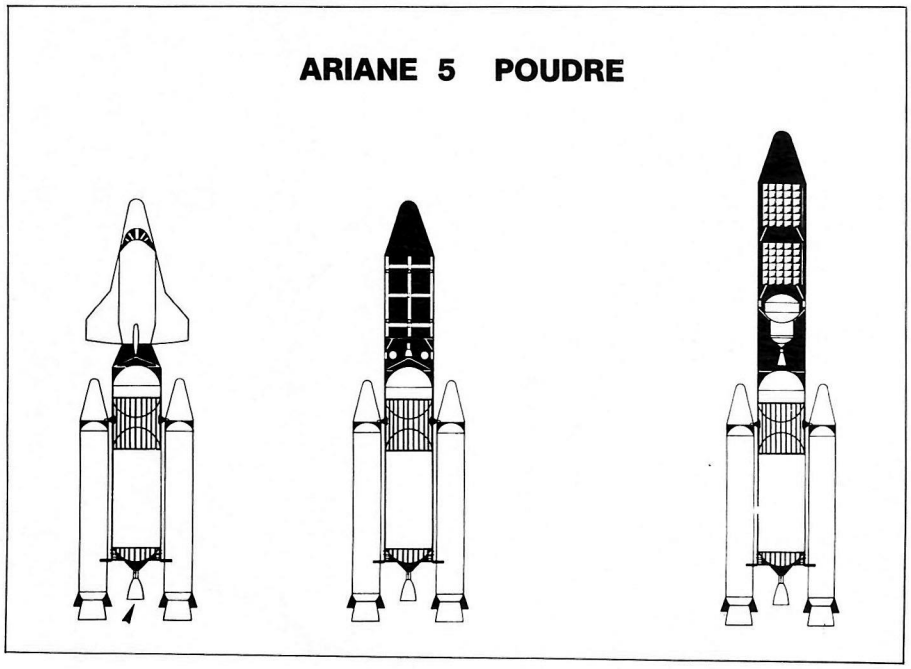
FARNBOROUGH AIR SHOW

Operationally, the biggest difference between HOTOL and an Orbiter like Discovery is that HOTOL will be unmanned. Automatic and remote piloting systems capable of controlling launch, ascent, orbital manoeuvring, payload management, re-entry and landing are already in existence. Without the need for crew accommodation and life support, the size of the vehicle can be reduced. A significant decrease in propellant weight achieved by using a novel propulsion system enables further size reductions to be made. It measures 55 metres in length with a wingspan of about 17 metres. Its 9×4.5 metres payload bay should be capable of carrying satellites of up to 7 tonnes in weight to orbit. (1 tonne = 1000 kilograms or about 2200 pounds, almost the same as an imperial ton)

It's a 'single stage to orbit' vehicle, an approach to rocket design that has been largely discarded in favour of staged rockets like the Saturn V. It carries all the fuel necessary for a mission on-board, unlike NASA's Orbiter, which carries 1.5 million kilograms of fuel in an external tank jettisoned shortly before the vehicle achieves orbit. Whilst Discovery is solely rocket powered during its vertical ascent and makes an entirely unpowered descent to a horizontal landing, HOTOL is powered by a combination of rocket and air-breathing (jet) propulsion systems. It makes use of the fact that the vehicle rises through a sea of free oxygen which an air-breathing engine could use, instead of carrying heavy propellant oxygen in tanks to feed rocket engines. This weight saving contributes to the small size of the vehicle. Rolls-Royce is advising on propulsion. It should, therefore, be capable of making a powered descent to a horizontal landing on a conventional concrete runway of the length used by Concorde.



HOTOL – Concept for an unmanned HOrizontal Take–Off and Landing launch vehicle, conceived by BAe and Rolls Royce, to lift payloads of up to 7 tonnes to low earth orbit and to return, using standard aircraft runways.



Re-usable economy

HOTOL epitomises a radical change in the implementation of space hardware in recent years. The emphasis is now on re-usability. Europe seems certain to develop some sort of re-usable launch vehicle in the next decade. The European Space Agency (ESA) is examining the possibility of a re-usable Ariane. Given the improved flight availability, flexibility and economy of a re-usable space transportation system over throw-away launchers, Ariane's success in the face of a fleet of re-usable Space Shuttles may seem a little paradoxical. However, the Space Shuttle is trying to be all things to all people – a small space station for long flights, a launch vehicle for paying customers, a platform for orbital research and astronomical observations, etc.

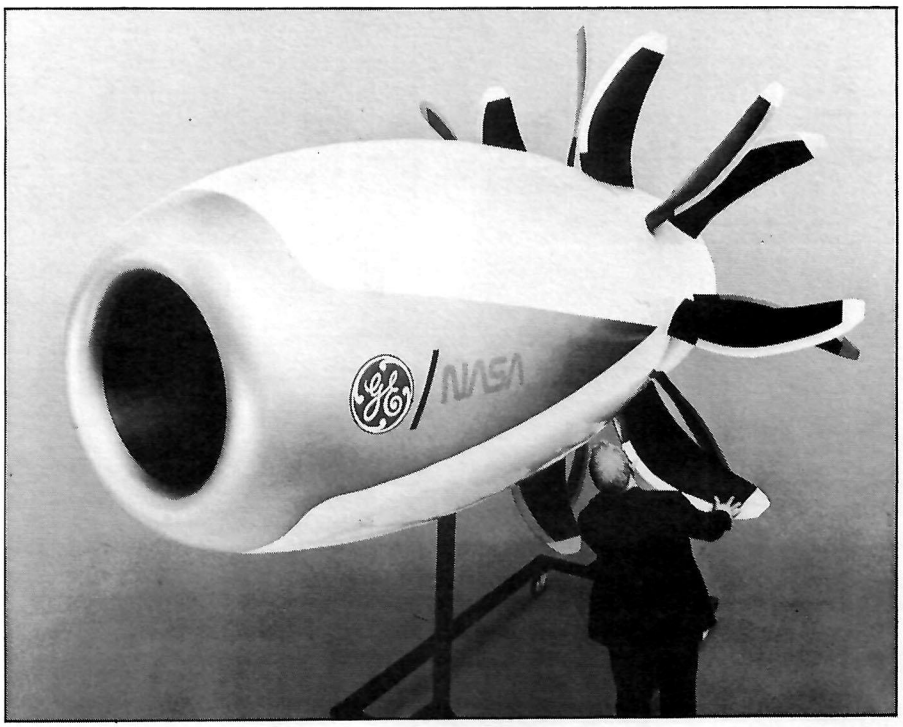
A custom-built throw-away launcher can compete successfully, especially in geosynchronous orbit applications, in which the Shuttle Orbiter cannot place satellites without an additional throw-away Payload Assist Module (PAM). But when the next generation of re-usable launchers come along, Ariane might fare less well. Hence the current debate about a more competitive European re-usable vehicle.

Whether or not HOTOL will step into that gap is another question. The major obstacle to its progression from model to reality is, of course, money. British Aerospace has already secured some funding from a 'national' source, although the identity of that source has not yet been revealed. Further major funding is, however, beyond the resources of either British Aerospace, or, I suspect, any national source, even with governmental support. But European collaboration on the same basis as Ariane or Spacelab is unlikely. France and Germany are very unlikely to contribute to the cost of a vehicle that will compete directly with Ariane, in which they have both heavily invested. Britain, on the other hand, has a relatively modest investment of less than 3% in Ariane.

Wot, no ESA!

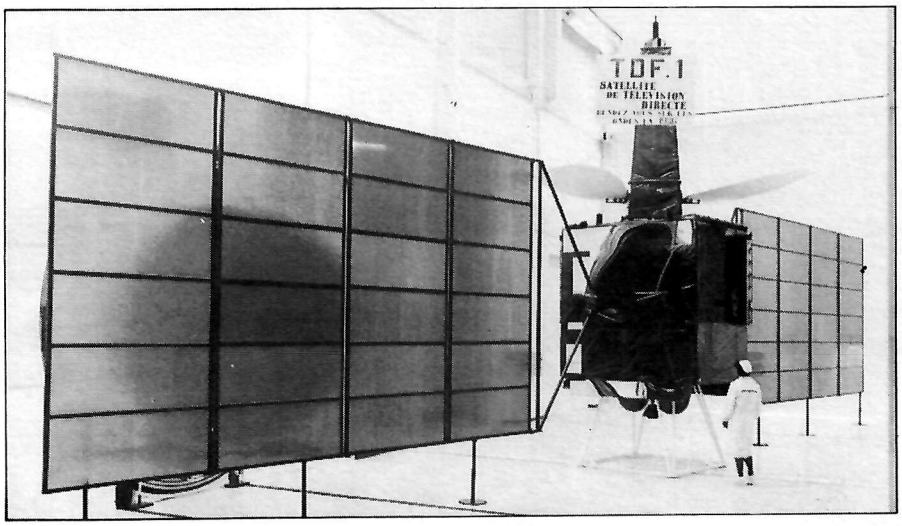
A 'future projects' report based on an ESA stand would have made interesting reading. I say 'would have', because ESA was not represented at Britain's premier showplace for the aerospace industry. Veteran space commentator, Reginald Turnill, reported in *Flight International's Show Daily* magazine that ESA had expressed an interest in exhibiting, but that by the time they had obtained approval for funding, their application to attend was received too late.

ESA's rather ambivalent attitude to publicity and the promotion of their activities contrasts sharply with that of NASA and its contractors. Although there was no NASA stand at Farnborough (and to the best of my knowledge there never has been), NASA's name and activities were prominently displayed on the American manufacturers' stands. NASA has learnt over the years that prestige and public support, which in turn attract the vote-catching patronage of policy-making politicians, can only be secured if the public at large are continually shown evidence of what the agency is doing for the dollars it consumes. NASA's sprawling publicity machine serves that purpose amply, if a little sluggishly at times.



General Electric's impressive mock-up of the Unducted Fan engine – a development of NASA aeronautical research. Photo: General Electric

TDF-1, the French version of the Franco-German direct broadcast TV satellite. The German version is called TV-SAT. Photo: Aerospatiale



NASA deliberately facilitates the distribution and publication of information and in particular photographic images of its civilian space ventures by declaring that they are 'in the public domain' – public property in other words. My own experience of ESA's publicity arm has revealed much more resistance to the distribution and publication of photographic images of its activities. This reluctance to make images freely available and incidents like its inability to organise funding for a stand at one of the world's major air shows doesn't leave a favourable impression with the people who fund its activities – ultimately you and I through our taxes.

Farnborough's astronaut

Martin Marietta's stand looked set for a stampede of space buffs of all ages on the public days later in the week. It featured a full-size mock-up of NASA's Manned Manoeuvring Unit (MMU), first used on a Space Shuttle flight by Bruce McCandless to move around the Orbiter without any physical attachment to it. A model of the Space Shuttle showed two astronauts in their MMUs still attached to the flight support stations in the payload bay.

Aerospatiale made up in part for ESA's absence. They provided details of a study currently under way for a manned vehicle to be launched by a future version of Ariane – Ariane 5. At the moment, Ariane 1 is operational and Arianes 2, 3 and 4 are in development. There are already 15 orders for Ariane 2 and 3, and three orders for Ariane 4. Unmanned versions of Ariane 5 are intended to be semi- or fully-recoverable. The first flight model of Arabsat, a telecommunications and community TV satellite for the 22 Arab League countries, is under construction and testing at Aerospatiale's Cannes facility. Aerospatiale is also participating in the TDF-1 project, the French version of the Franco-German direct TV broadcast satellites. TDF-1 is produced by the Eurosatellite group, comprising Aerospatiale, Thomson-CSF (France), MBB and AEG-Telefunken (Germany) and ETCA (Belgium).

NASA's familiar logo appeared on an extraordinary aircraft engine. Oddly curving propellor blades (two sets rotating in opposite directions) are mounted as 'pusher blades' on the back end of what looked like a conventional jet engine. The UDF (Unducted Fan Engine) is a new type of engine being developed by General Electric and arising out of NASA research into advanced propellor design. The startlingly odd arrangement is claimed to reduce fuel burn in standard twin or trijet aircraft by 40-60% and up to 25% over ducted fan engines coming into service during the next decade. Flight testing is due to begin in 1986 and aircraft should be using the engine in the 1990s.

Mini world

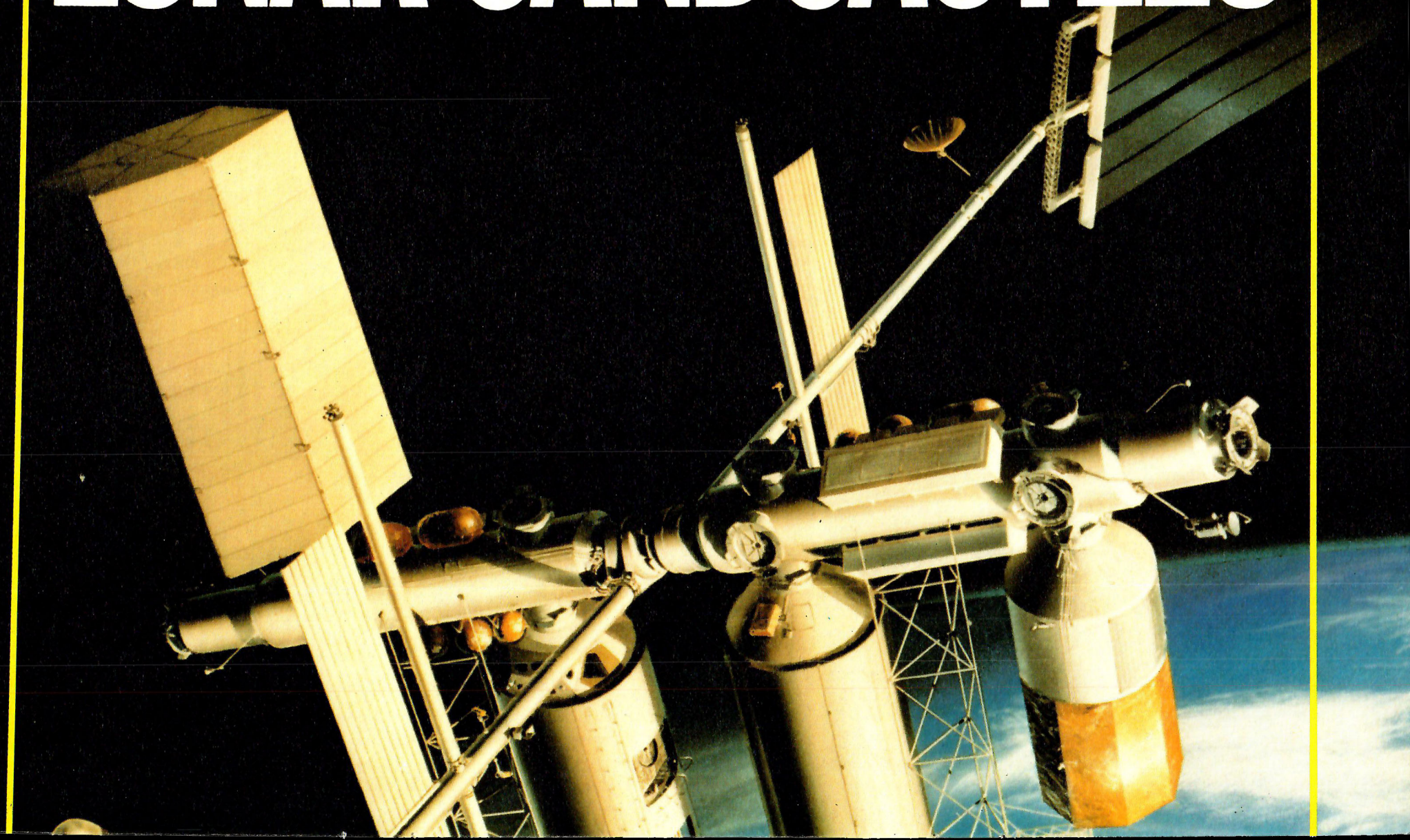
When Spacelab 3 is launched by the Space Shuttle in 1985, it will carry a 'mini world' built by Aerojet Electrosystems of Azusa, California. It certainly is a mini world, measuring only two inches in diameter and weighing less than three pounds. The golf-ball sized world will spin just like the real thing and it will have an atmosphere and gravity. It will even have temperature gradients – warmer around the equatorial region and cooler at the poles. Meteorologists hope to learn more about storm cells and how they form, grow and move by observing the mini planet as it spins weightless in Spacelab. The 'planet' is a gold-plated sphere (because of its optical and thermal properties) sitting inside a sapphire dome (because of its optical and electrical properties).

There was little else for space buffs to get excited about. Spaceflight is still a fringe activity at Farnborough International. The exhibitors are there to sell their products and services to the aviation industry. The flying display is always worth staying for as some of the most experienced pilots in the world put their aircraft through demanding routines.

This year, the display attracted more publicity than it otherwise might have expected to when a de Havilland Buffalo made a 'heavy' landing in difficult wind conditions, crumpling onto the runway in a ball of flame. Fortunately, the crew of two and a passenger walked away from the smoking wreckage. In fact, the unfortunate incident turned out to be a rather good advertisement for the inherent strength and safety of the design! On impact, the undercarriage and wings absorbed the force of the crash, leaving the fuselage relatively unscathed.

Soviet manufacturers brought their aircraft to the Show for the first time this year, including the world's biggest helicopter. I wonder how long it will be before the exhibition halls are graced with the mock-ups of Soyuz and Salyut spacecraft that have appeared at the Paris Air Show. And let's hope that ESA get their act together for Farnborough International '86. I'll be there!

LUNAR SANDCASTLES



BORED WITH BRIGHTON? BLASÉ ABOUT BLACKPOOL? THE BAHAMAS ARE A BIT BRASH THESE DAYS... CAN'T THINK WHERE TO BOOK FOR YOUR TWO WEEKS NEXT SUMMER? MARK EVELEY PACKS HIS ZERO-G BUCKET AND SPADE TO REPORT ON THE RESORTS WHICH WILL BE "IN" FOR THE JET-SET IN THE NEAR FUTURE.

You are preparing for your first trip into space. The hot Florida sunshine beats down as you climb down from the transport van at the base of the launch pad at Cape Canaveral. A lift speeds you to the top of the launch tower for the short walk to the hatch into the Space Shuttle. You are strapped in and, a short while later, the engines fire and you begin the holiday of a lifetime.

Pure fantasy? A ridiculous idea for the man-in-the-street? Not at all. NASA is looking right now at the idea of taking non-astronauts into space. In fact Charlie Walker, who went up in the Shuttle at the end of August, is an engineer for McDonnell-Douglas, who paid NASA $80 000 for him to operate their experiment.

While free flights aboard the present-day Shuttle will probably be limited mainly to journalists, artists and the like, there are those who predict that space tourism will be established in a few years. In fact, tourism could be a major driving force in the expansion of Mankind into space.

Space Hotels, circling the Earth hundreds of miles up in space, could provide a host of experiences unavailable back down on Terra Firma. By far the most attractive aspects will be weightlessness and the breathtaking view. The cost, while high, will still be within the reach of thousands.

The idea of holidays in space is not new – it has been around almost as long as the Space Age itself. Thomas Cook, the travel company in Peterborough keeps a list of about a thousand people who have registered since Neil Armstrong made that 'giant leap' for Mankind in 1969 – enthusiasts who want to be aboard the first commercial space trips. While it is just a 'fun' idea – registrants receive a certificate to prove they want to be space-bound – it does show the interest is there.

Travelling to the Moon is further in the future although Barron Hilton of the hotel chain did consider it in 1967 (before Man had even got there). Hotels half-buried in the lunar soil would be well protected and could provide a whole host of celestial diversions for the tourist.

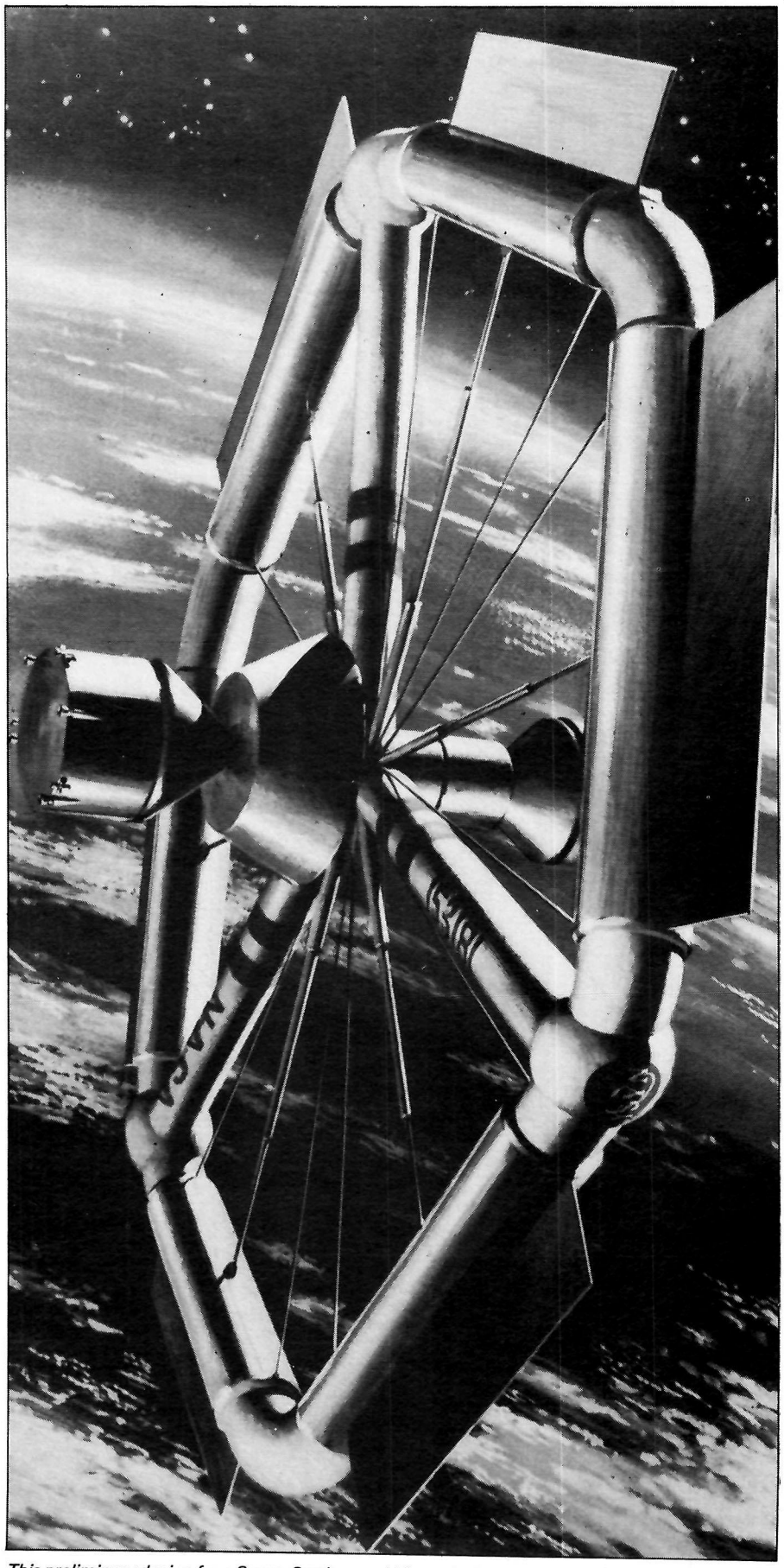
Hotels in orbit around the Earth are a distinct possibility, attractions could include weightless acrobatics, ballet, exercises and swimming (in air currents instead of water) even for the most overweight.

We will be able to invent games unplayable down on the gravity-ridden surface of our planet. Krafft Ehricke, a V2 rocket pioneer and space visionary, suggested a game of '3D tennis' in 1967 in which the net would be stretched across the middle of a chamber to form a wall with a circular hole in the middle. Players would then not only have to cope with moving sideways but up and down as well.

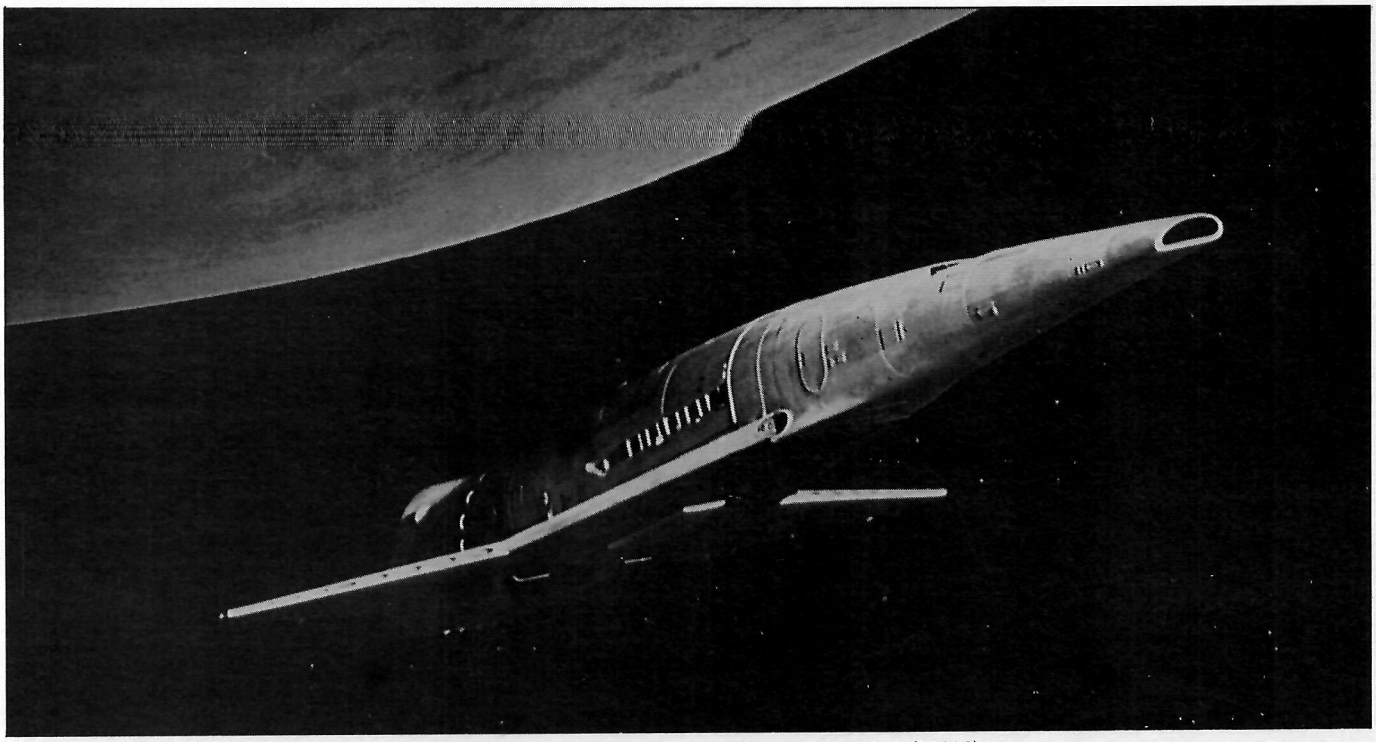
What about 3-dimensional squash, hitting the ball against a pillar in the middle of room? Or even flying like a bird under your own power by flapping wings strapped to your arms?

The Skylab space station astronauts of 1973/4 invented a game of 3D handball played around the circumference of their cylindrical home in space. They even played 'tag' by running over the top of lockers attached to the wall, their circular movement producing a type of artificial gravity to hold them down. But when they made mistakes they went tumbling off.

The nine Skylab crewman also discovered a problem: the low pressure of the air inside



This preliminary design for a Space Station could form the basis for a hotel by adding modules to the docking ports. Old science fiction designs tended to use rotating wheel-shaped stations to provide artificial gravity. (NASA)



This shuttle was used in '2001: A Space Odyssey' to ferry passengers to an orbiting space station. (MGM)

their station (using reduced pressures means that structures do not have to be as strong or heavy) made their darts unusable. The flights just couldn't 'bite' into the thin air and the 'arrows' wobbled as they moved slowly to the board.

Ehricke suggested building 'other world' compartments where the surfaces of other Worlds could be simulated, just as we build mock-ups of of Stone Age villages in museums today. We could even build chambers where budding Captain Kirks could fly fleets of model spacecraft, or even engage in battle with the Klingons!

The view back towards Earth or out into the Universe will be spectacular, from our hotel. Even small telescopes will reveal splendours of the heavens invisible from the ground. The stark features of the Moon will spring to life and the planets will no longer appear as tiny, shimmering dots. Past space crews have admitted that their favourite method of relaxation was simply to gaze at the Earth rolling by in its mantle of blues, greens and browns. They never tired of the view – even after six months!

What to wear

More dangerous would be to go outside the hotel for a spacewalk or even to fly on a small 'space scooter' to another hotel. Even today Shuttle astronauts do not have to wear suits tailored to their every measurement but have ones made up of standard fittings. All they do is slip into a pair of legs with integral boots and push their bodies into an upper section that snaps into position. Gloves and helmets are then added.

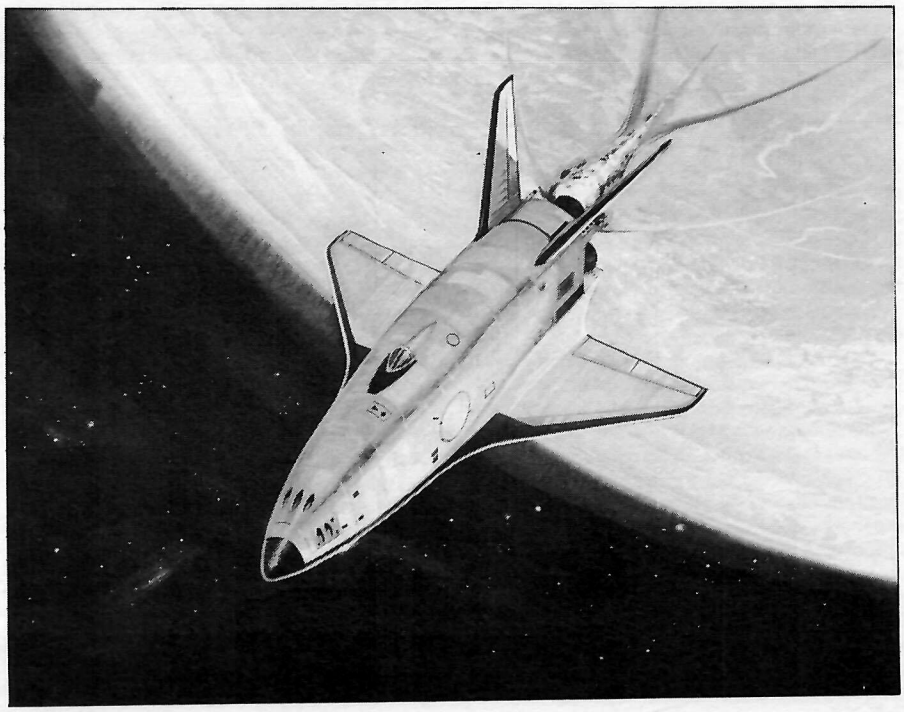
These suits are still expensive (about $100 000 each) so for a Space Hotel they will have to be considerably cheaper to make them worthwhile. But think of the feeling of awe and wonder as you float free with nothing but a few thin layers of material between you and the Universe. Astronauts report no sense of height or vertigo while watching the Earth turn 250 km below.

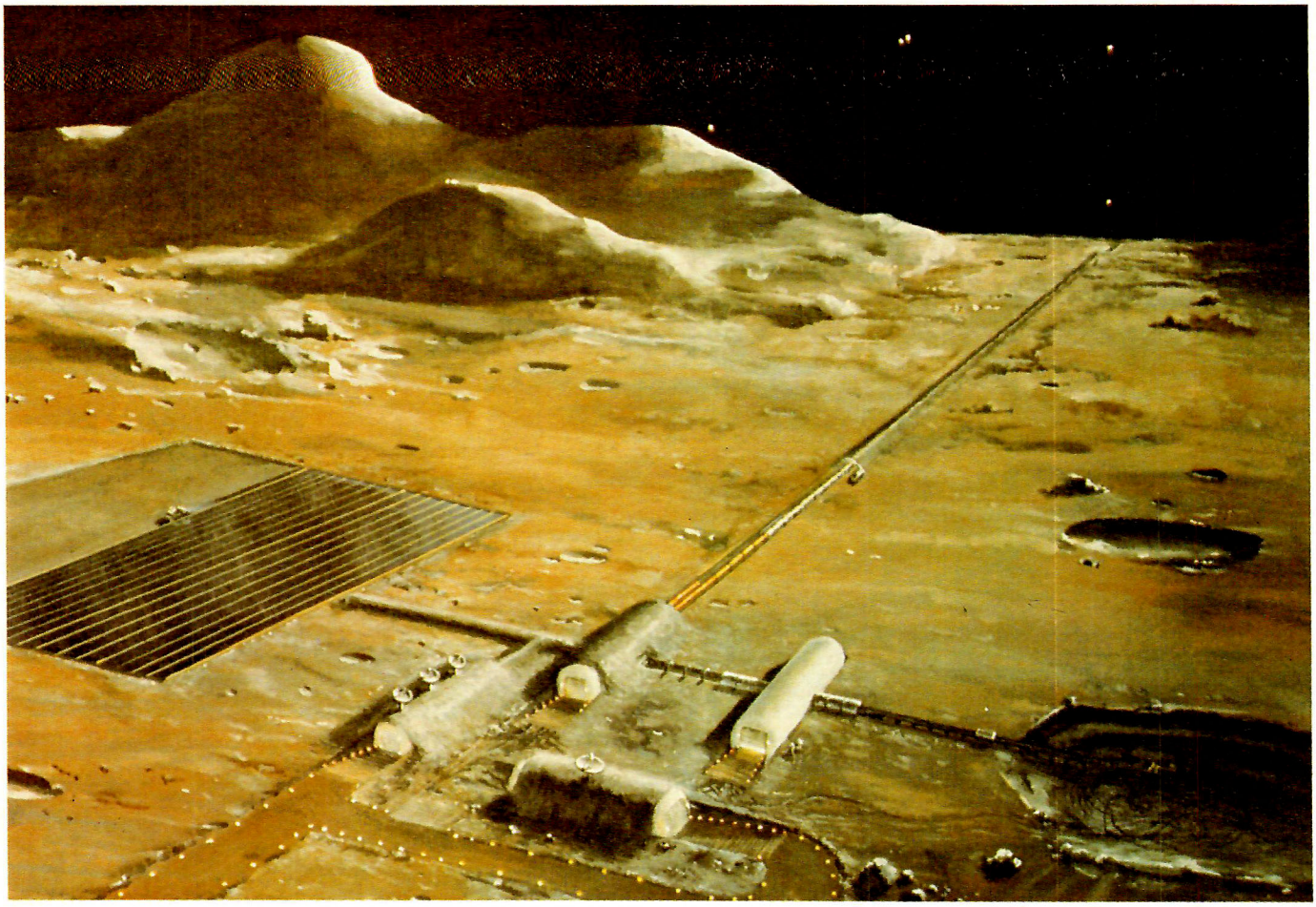
Most tourists hope to acquire a tan during their holiday but a trip into space could beat any earthly resort since Earth's atmosphere filters out most of the Sun's harmful ultraviolet radiation – the same radiation that darkens our skin – going above it would expose us to the full glare. Careful exposure in space solariums would produce extra-rapid tans.

Another integral part of any holiday is sending postcards to relatives and friends to make them envy the good time you're having. The cost of using comsats has come down so much that it will be possible to send electronic cards bearing a much-desired 'From Orbit' postmark.

NASA's 'Task Force for the Study of Issues in Selecting Private Citizens for Space Shuttle Flight' reported in June 1983 that 'It is feasible to fly individuals . . . in the mid to late 1980's without undue risk to crew safety' . . . Seats will be made available (current estimates are for

This Rockwell International study version of future Space Shuttle would take off horizontally from a runway, rather like a conventional airliner today. (Rockwell)





Hotels will be established on the Moon one day. (NASA)

eight vacancies per year). The group believes it is desirable for NASA to fly observers in order to enhance public understanding of space flight.

First candidates will probably be journalists, artists or others able to express graphically the wonders of space travel. People such as singer/composer John Denver and TV presenter Walter Cronkite are well-known space enthusiasts.

Anyone with a clean bill of health will be able to withstand the acceleration into orbit at speeds of up to 17.500 mph but, just as with some of the extreme roller coaster rides, people with heart or back trouble might be banned. Shuttle flights do not tax their occupants much above three 'G' but even that could be too much for an unhealthy person. It's still a far cry from the early days when the first astronauts had to suffer 15 times their own weight!

The major requirement for space holidays is to bring the cost down. Present shuttle cargo costs are £60 million per ton – a price that millionaires could afford but not the man-in-the-street. By contrast, a transatlantic Jumbo Jet costs £1,000 per ton for cargo. Allowing for other factors, the Shuttle is 100 times too expensive. Space engineer David Ashford proposes a challenging solution: build a low-cost fully-reusable rocket and a permanent space hotel and charge people £5,000 for a few days holiday in orbit. The cost is within the reach of enough people to make it economically viable.

Ashford's analysis shows that today's rockets are cheap enough to launch the hotel into space but that the ferry service for passengers needs to be much cheaper. He proposes a Spacebus built in two sections. The orbiter would carry 30 passengers to the hotel. At lift-off it would be boosted by a vehicle like a supersonic aircraft, twice the size of Concorde, and taking off horizontally from a conventional runway.

Space law and order

One area that will have to be resolved before a Space Hotel could be operated is its legal status. At the moment, laws are not completely clear because they have been formulated to cope with present-day exploration and to prevent any one nation laying claim to, for example, the Moon. What laws would operate in a Space Hotel? Cyril Horsford, British barrister and a director of the International Institute of Space Law from 1961 to 1972, believes that 'by the time such a venture is underway . . . international arrangements will be in force, dealing with such matters as insurance and health and safety regulations.

'There is already in force a treaty signed in 1972 dealing with liability for damage and injury caused by space operations, although additional arrangements will no doubt be needed to cover passengers and tourists in space, similar to the present airline regulations, such as the Warsaw Convention.'

Article 8 of the 1967 Space Treaty allows states to retain their ownership of equipment launched into space, and by the the same token jurisdiction over their own personnel. A national base, colony or hotel would operate according to its national law, but special arrangements would have to be made if it is an international undertaking.

A similar situation exists at present in the barren wastes of Antarctica – it is not under international control, but it is demilitarised and all territorial claims are frozen. The various research bases work under their parent nation's rules in accordance with international regulations.

Again, if the Space Hotel is international, what money would be used there? A tourist visiting America, for example, has to buy US dollars but no money is yet used in space. Perhaps space tourists would have to convert their home currencies into standard 'space credits', although the strength of the US dollar and the likelihood of the hotel being American-owned makes it possible that dollars would be in use 200 miles above our heads.

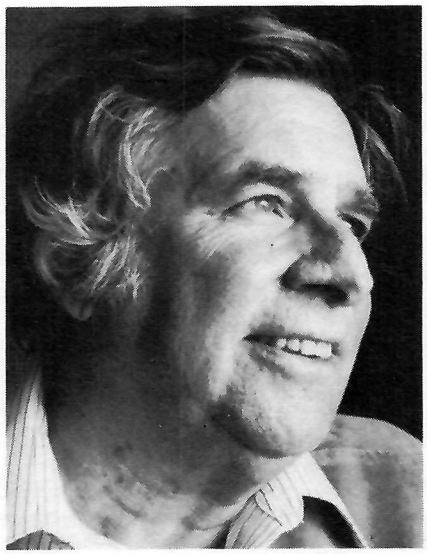
All the technology for a Space Hotel is within reach now. A valuable spin-off is that once cheaper rockets are available then other commercial and scientific projects will be possible. Cheap tourist travel into space could provide the basis for Man's permanent presence there in space colonies.

In the next century, trips will be available to the Moon, imagine travelling from a 100-room lunar hotel over the stark, airless landscape to visit the Apollo museum to see the footprints left by Neil Armstrong in July 1969!

WISDOM OF THE GREAT BIRD

GENE RODDENBERRY IS KNOWN THROUGHOUT SCIENCE FICTION AS THE MAN WHO CREATED AND GAVE US *STAR TREK*, BUT WHILE THE MAN IS STILL INTERESTED IN WHAT IS NOW HIS 20-YEAR-OLD BABY, HE HAS MOVED ON.

by Wendy Graham



'Remember me as a philosopher, not as a successful or rich Hollywood producer' is what the man dubbed 'The Great Bird of the Galaxy' asks of fate.

In fact, the much criticised *Star Trek – The Motion Picture* was very much a personal statement of his views on the future ties between man and machine.

'I don't think the Enterprise will ever be built,' he told me at the Galileo Star Trek Convention in Newcastle, where he was guest of honour.

'The human body is too frail for such space exploration. A machine can go on and on and be okay in many different circumstances. A machine can be a thing of great beauty – it doesn't have to be all cogs and rachets. I believe that the real future Enterprise will be a machine with a consciousness placed in it.

'I sometimes think we humans are an intermediate life form, whose purpose is to evolve to create a new life form which is machine. I like the concept of anything which evolves. Some say that the universe is a giant mechanism to evolve and perfect life.

'Even though I follow many Buddhist thoughts, I don't believe in reincarnation. My view is that we are all fragments of the Almighty's conciousness, we are all terribly important, and I feel I have achieved something with my life – that I have made use of my piece of consciousness.

'Religion itself is a terrible thing to inflict on people – all those wars – but I do agree with the Buddhist dream of humanity becoming more civilised and tolerant. Have you come across this definition of a civilised person? A person who is delighted when someone says "I disagree because . . .".'

'I feel like a stranger in a strange land sometimes in the USA. Britain prizes culture a little more; you are generally more tolerant. An ideal people would be tolerant of all.

'God has treated me well. I have enormous curiosity. Sometimes I can hardly bring myself to sleep. I wake at 5 am and start to read. I try to involve myself in many things – on the advice of Arthur C Clarke.'

Computers and bikes

Gene is now known round the world as much for his interest in futurology as he is as the creator of *Star Trek,* and he is showing his interest in computers by owning four different ones, one of which is in use for the writing of his new book, to be called *Report From Earth.* Relaxations include his work at the goldsmith's bench and he and wife Majel Barrett share Lapidiary equipment. Gene also races sailboats and bikes – though not as much as formerly – 'Majel made me sell the big, powerful ones'.

But it is the exploration of the ways in which mankind might evolve which interests Gene most.

'Another theory, this time from the Smithsonian, is that the next dominant species, the one to follow man, is a socio-organism.

'You see, this theory parallels Darwin. Evolution started with one cell, then cells got together because it was more efficient, then they stayed together with the cells specialising.

'You could look upon each human being as a cell in a unit – a family or other such unit.

'We are already part of a socio-organisation. We are members of school units, work units, town, county, country.

'The advantage in this is that cells don't have to be physically close and can be part of different organisations. Slowly each individual cell gets less important, so that on a very old, matured planet, maybe, there are only groups, not individuals.

'China is becoming that sort of society, in many ways, but as a strong individualist I don't like that theory, personally.'

'Writing for me has excitement and joy and satisfaction,' said Gene, but he added it was unlikely he would ever create another *Star Trek.* 'I did it, and won.'

'Science fiction is a marvellous medium for a writer. You have any situation, you can make any comment. With *Star Trek* we were commenting on the war in Vietnam, on intolerance, on many things.

Two characters who have stood the test of time as finely drawn by Gene Roddenberry and given flesh by William Shatner and Leonard Nimoy – Kirk and Spock. Photo: Paramount.

'I tried to find a format to write comments on TV which, of course, was very censored.'

The censor's handiwork

And, of course *Star Trek* is still running into censorship problems, with the BBC decision not to show four stories.

'I disagree very much with the BBC about *The Empath,* for example. There is hurt and pain, yes, but we had this woman who was drawing that hurt and pain into herself.

'I object to violence and sex when it is put into a show simply because that show is going slowly. I object to cowboy movies – I mean they hit each other on the face then get up. That's just not how it is in life.

'And death is shown as such a lovely thing in war. NO. Men scream their guts out in agony.

'Copulation is a lovely thing, but you don't need to bare your breasts in a film just because that film is going slowly. All that writers have left in the USA is sex and violence.

'When I write something, I don't think in terms of children or adults. I would rather have a 10-year-old watch *Deep Throat* than a film about shooting people in the belly.

'The lines between sex and art and violence and exploitation are hard to draw. You have to establish the type of show you're doing and stay true to that type.

'That being so, I don't object to classifying material so you will know what you're getting if you chose to go in. There are some things you can't let a six-year-old into, but when kids reach teenage I think you have to take a chance and tell them the truth,' said Gene.

It was with a kind of inevitability that the conversation moved on to that TV series – 'The night it premiered on TV my father walked down the street and apologised to the neighbours!

'But every year that goes by, *Star Trek* is going to get to look more dated, though we won't be as bad as some. We knew when we were doing the show we were doing some things wrong – the size of the communicaters for one example – but the point of any art is not what it is but what it says. But the enterprise and crew had to be 20th century even though the date was the 23rd, for we were making it for a 20th century audience. A show which was realistic for the 23rd century would have angered or scared a 20th century audience. Imagine, for example, a person from the 10th century transported to the present.

'Humans think in images, and the Enterprise and Kirk image are easy for us to handle. I never believed that the Enterprise would get to the stars in three centuries – humans and ships will be very different to what they are now and very different to what gets on the TV screen – but, meanwhile it makes sense to have *Star Treks.*

Hope for the Enterprise?

'I felt terrible about the destruction of the Enterprise – but once I decided not to exercise my option to write and produce, well, if you bring in new people you have to let them do it. I do hope they will somehow bring the Enterprise back.'

Gene's role now with *Star Trek* is somewhat like our Queen's constitutional role in British Government. He can advise, encourage or warn, and while he takes a back-seat role in the production of the films he is there, with the ultimate option that he can publicly pull out, and take his support away if the production violates his basic standards for *Trek.*

'I certainly hate the pregnant duck appearance of the Excalibur, I'm afraid that the people making *Search for Spock* didn't have my love for vessels. Remember – 'these are the voyages of the starship Enterprise, NOT the Excalibur!'

Gene suggested that any fans who felt strongly that the Enterprise should be saved should write to Barry Diller, Chairman of the board of Paramount.

Gene; in common with most fans, does not like the uniforms worn in the films. 'The TV ones were a bow in the direction of casualness. There was one director who wanted the crew to salute.

'I had mixed feelings about *Wrath of Khan.* I thought there was too much violence. Khan in the TV episode *Space Seed* had strengths and weaknesses. He had both good and bad points. In the film he was all evil.

'*Search for Spock* was a good film, and it looks as though Leonard Nimoy will be directing the fourth film, as well. I hope they will get away from Genesis though.

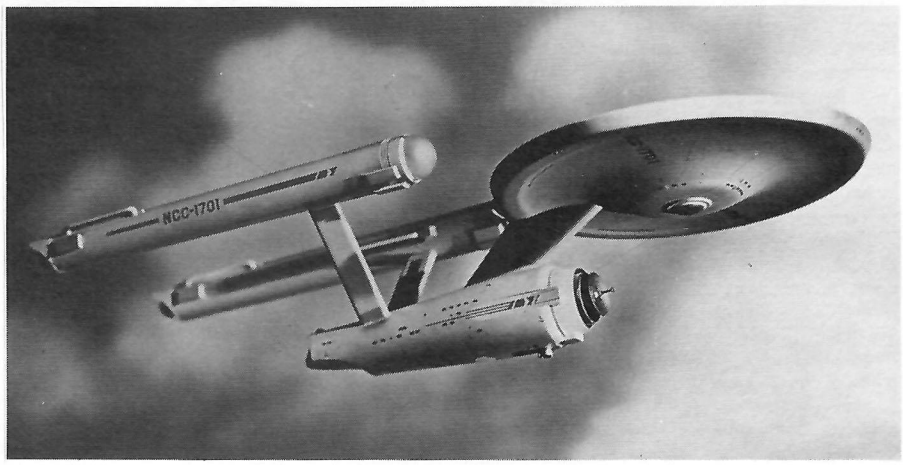
'I have an enormous affection for *Star Trek* fans – I've known them for 18 or 19 years, and they are lovely gentle people. I'm particularly fond of disabled fans – I was disabled as a child, and I see loveliness in them. Outsiders do not understand that *Star Trek* fans are not poopy teenagers – I know of US Senators who are fans, and heads of university departments.

'*Star Trek* was made with goodwill and good intent. We messed it up sometimes, as anyone does, but I think and hope that some people heard our comments on respect and tolerance.

'One thing humans must be aware of is that society must be diverse.

'Diversity is loveliness. Our wealth is our diversity.'

Hands up all who loved the Enterprise before the engineers changed things. The rounded engine nacelles proclaim this the TV Enterprise, before her big-screen refit. Photo: BBC



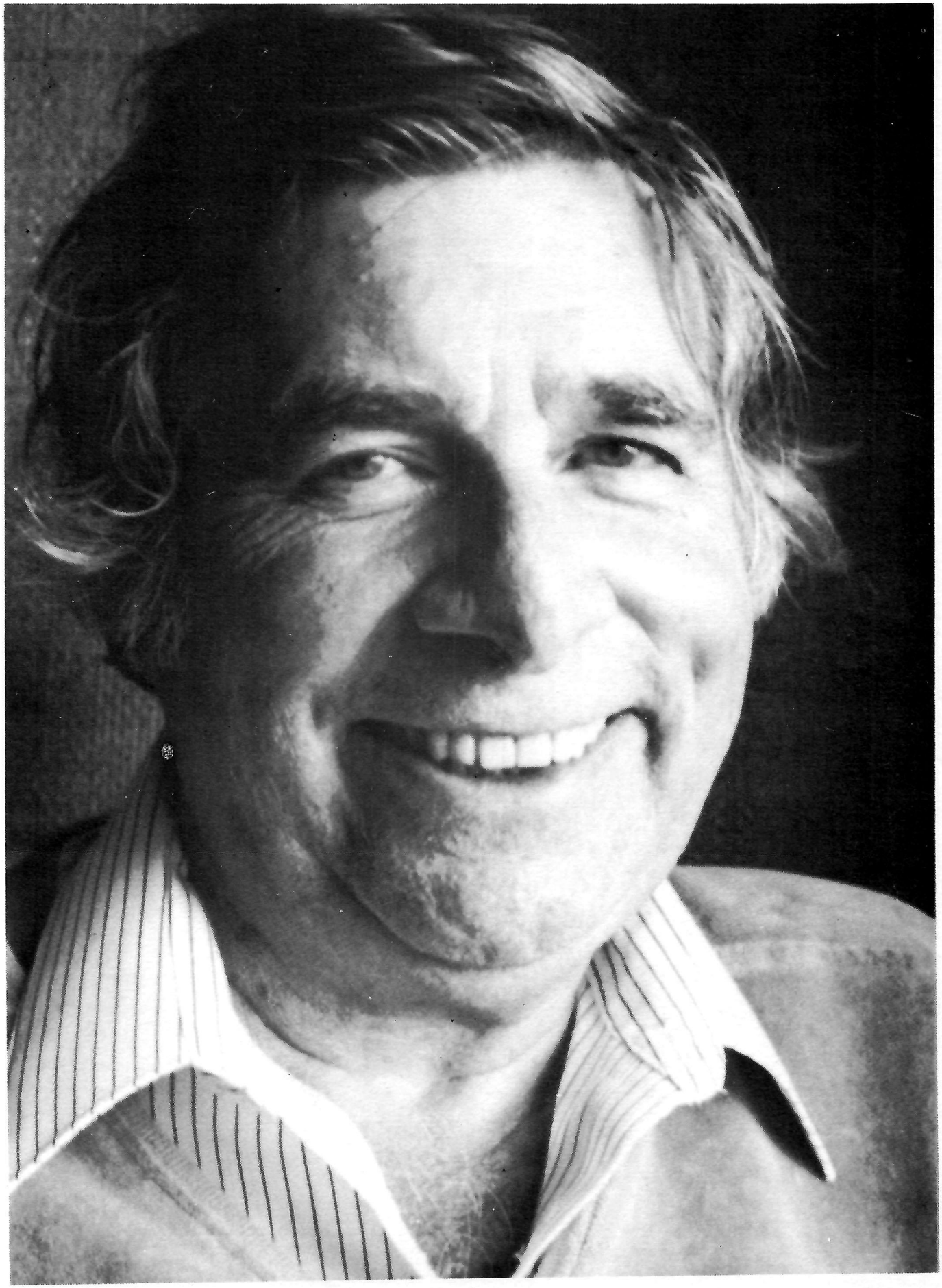


Photo: Wendy Graham

SHUTTLE UPDATE

AFTER THREE FALSE STARTS, NASA NOW HAS THREE OPERATIONAL SPACE SHUTTLES. DISCOVERY FINALLY MADE ITS WAY INTO ORBIT AT THE END OF AUGUST WITH ITS FIVE MAN AND ONE WOMAN CREW. GEOFF ENDACOTT REPORTS ON THAT FLIGHT, AND ON WHAT CHALLENGER AND COLUMBIA AND NEW SHIP ATLANTIS WILL BE DOING IN THE NEAR FUTURE

The August flight of Discovery restored the somewhat tarnished image of the shuttle programme when the crew successfully launched three satellites. The only minor problem encountered was the failure of the Shuttle's waste disposal system. This occurred when waste water dumped through a valve became frozen, forming an icicle on the outside of the spacecraft.

The blocked valve prevented the crew from using their toilet, but this was not the main problem. Mission control were worried that the icicle would break free during re-entry and damage some of the thermal protection tiles. Although this was unlikely to endanger the crew, any tile damage would have to be repaired, thus threatening to delay Discovery's next mission.

The offending icicle was eventually removed using the Shuttle Remote Manipulator System arm and Discovery returned to earth relatively unscathed.

Mission Specialist Judith Resnik was the second woman to fly aboard the Shuttle. In space, her normally long curly hair floated out in all directions, leading one commentator to describe her hairstyle as looking like a Brillo Pad! Space hairdressing is, however, not one of the most serious problems women astronauts have to contend with.

By the time you read this, Challenger should have made its sixth flight. The crew of seven is the largest to date for any space mission. Sally Ride should have become the first American woman to fly on more than one mission and together with Kathryn Sullivan she made this the first ever two woman flight.

Anna Fisher should have kept the tradition of women in space alive by flying on Discovery's second mission in November. Although a total of four women will have flown on Shuttle missions this year, it will be a long time before we see the first all-woman crew. This is because all NASA's women astronauts are Mission Specialists. No women have trained as Pilots and until this happens there will have to be at least two men, the Commander and Pilot, in each crew.

The next scheduled mission carries a military payload aboard Challenger. This is due for launch on, or soon after, December 9. The crew will be commanded by Ken Mattingly, who also commanded the fourth Shuttle flight. He will be joined by Pilot Loren Shriver and Mission Specialists James Buchli and Ellison Onizuka. This four man crew is the smallest since the sixth Shuttle mission in April 1983.

First flight for two

Discovery makes its third flight in January with the second Spacelab mission, Spacelab 3. Problems with payloads aboard Spacelab 2 have forced that mission to be delayed until April, so Spacelab 3 will fly first.

The Commander of Discovery will be Robert Overmeyer, who was Pilot on the fifth Shuttle flight in November 1982. He will be joined by Pilot Frederick Gregory and Mission Specialists Don Lind, Norman Thagard and William Thornton. Thagard and Thornton have flown before, on the seventh and eighth Shuttle missions respectively, but this will be the first time in space for Gregory and Lind.

Don Lind has had a particularly long wait for his first ride into space. He joined NASA as one of the Group 5 astronauts in April 1966, more than three years before the first moon landing! Gregory joined NASA with Group 8 in July 1978.

Two Payload Specialists, Dutch born Lodewijk van den Berg and Chinese born Taylor Wang complete the crew.

Ths mission will concentrate on materials processing in space. Other major experiments will deal with life sciences, environmental observations, technology research, astronomy and space plasma physics. Spacelab 3 will use the long version of the laboratory module and a special cargo bay instrument support structure.

Challenger returns to the skies in February under the command of Karol Bobko. Pilot Donald Williams and Mission Specialists Rhea Seddon, Jeffrey Hoffman and David Griggs are included in the crew which will launch the Telesat-I communications satellite and the second NASA Tracking and Data Relay Satellite.

This latter satellite was originally scheduled for launch in August 1983 on the eighth shuttle mission. The launch was postponed when the Inertial Upper Stage used on the first TDRS deployment in April 1983 failed to place the satellite in the correct orbit. On that occasion NASA managed to retrieve the situation by using the satellite's own thrusters to gradually nudge it into position, but they were not prepared to chance the second TDRS until the problem was fully understood.

The final crew member will be a French Payload Specialist. Although NASA have yet to announce his name, it will almost certainly be Patrick Baudry who trained as backup to French cosmonaut Jean-Loup Chretien.

Discovery is scheduled to perform an orbital "swap" in March when it deploys one satellite and collects another, the Long Duration Exposure Facility which was left in orbit by Challenger last April. The 57 experiments on board will have been exposed to space for nearly a year by the time Discovery brings them home.

Commander Daniel Brandenstein, Pilot John Creighton and Mission Specialists Shannon Lucid, John Fabian and Steven Nagel will also deploy the third Syncom IV Leasat in the now customary 'frisbee' style. They will be joined by either Gregory Jarvis or John Konrad flying as a Payload Specialist. Jarvis and Konrad flying as a Payload Specialist. Jarvis and Konrad are employees of Hughes Aircraft Space and Communications Group, the firm responsible for the Leasat programme.

Spacelab 2 will fly aboard Challenger in April without the habitable module. The payload bay will contain three pallets, an 'igloo' containing Spacelab subsystems and a special support structure for a large cosmic ray experiment. The crew of seven will operate experiments remotely from the aft flight deck of the orbiter.

The mission includes experiments in solar physics, plasma physics, infra-red astronomy, high energy physics, atmospheric physics, life sciences and technology.

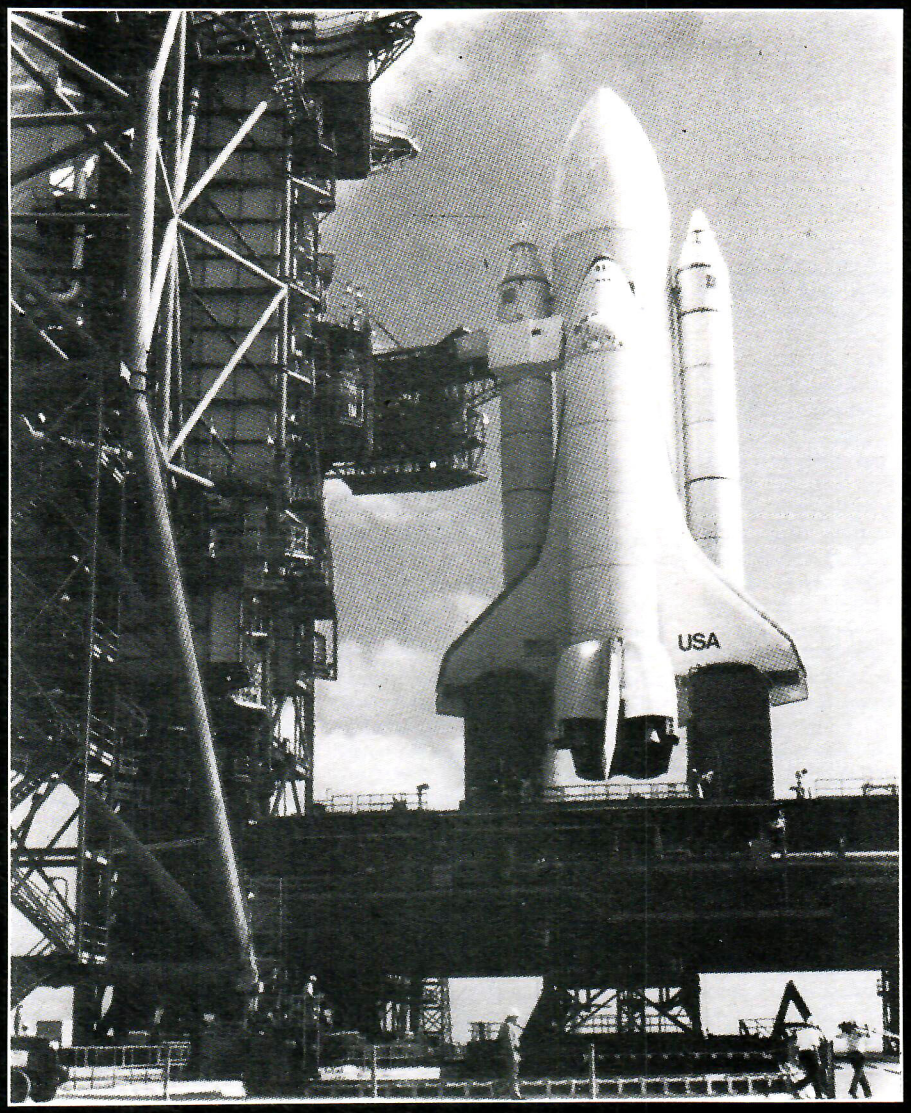
Challenger will be under the command of Gordon Fullerton, with Pilot David Griggs, Mission Specialists Story Musgrave, Anthony England and Karl Henize completing the NASA complement. Loren Acton and John-David Bartoe will fly as Payload Specialists.

Columbia's Spring flight

Columbia returns to orbit late in May after a major refit. Joe Engle will be Columbia's Commander for the second time, with Pilot Richard Covey and Mission Specialists James van Hoften, John Lounge and William Fisher. The payload will include three communications satellites, Telstar-3D, Arabsat-A and Morelos-A.

Challenger takes the third TDRS aloft in July with a crew of Commander Brewster Shaw, Pilot Bryan O'Connor and Mission Specialists Mary Cleave, Sherwood Spring and Jerry Ross.

Provided that the retrieval of the Palapa B-2 satellite has been successful, its insurance underwriters have the option of a relaunch in July 1985. The satellite went into the wrong orbit after its release from Challenger in February this year, due to the failure of its Payload Assist Module. Discovery should have



attempted a rescue on its second mission.

The fourth and final Leasat should be deployed in August, under the Supervision of another Hughes Payload Specialist.

The most spectacular mission of late 1985 is scheduled for mid-October. This is the West German sponsored Spacelab D-1 mission aboard Columbia. In Order to keep a round the clock watch on the experiments, Spacelab D-1 will carry three Mission Specialists and three Payload Specialists. With Commander Henry Hartsfield and Pilot Steven Nagel the crew of eight will be the largest for any space mission.

The three Mission Specialists will be James Buchli, Guion Bluford and Bonnie Dunbar. West Germans Reinhard Furrer and Ernst Messerschmid, together with Dutchman Wubbo Ockels, are Payload Specialists.

Another scientific mission to fly late in 1985 will be the Earth Observation Mission, EOM-1, now scheduled for launch in November. This will carry a short Spacelab habitable module and a pallet of experiment hardware in the cargo bay.

As the name suggests, the mission will concentrate on Earth observations and will also include the reflight of nine Spacelab 1 experiments on space plasma physics, solar physics, atmospheric physics, astronomy and earth observations.

The mission will mark the debut of the fourth operational orbiter, Atlantis. Veteran astronaut Vance Brand will command, assisted by Pilot Michael Smith. Mission Specialists will be Robert Springer, Owen Garriott and Claude Nicollier of Switzerland. Michael Lampton and Byron Lichtenberg will be Payload Specialists.

Lichtenberg flew aboard Spacelab 1 in November 1983, with Lampton as backup. Garriott was also a member of that crew and of the second manned Skylab team.

The new Shuttle launch facility at Vandenberg Air Force Base should also become operational late in 1985. The first Vandenberg mission will either be a military satellite launch or the Landsat 4 retrieval.

Fly Brittania

1986 should at last see the first British astronaut go into space to supervise the launch of the Skynet 4 military communications satellite. Although no definite plans have been made as yet, there is a possibility that Skynet 4 will be fitted in with Spacelab 4 in January 1986. What is known is that Britain's first astronaut will be one of four candidates, Major Richard Farrimond, Christopher Holmes, Commander Peter Longhurst and Squadron Leader Nigel Wood. Plans have also been made for another of these men to fly when the second Skynet 4 is launched later in the year.

NASA must be regretting their decision not to send a probe to intercept Halley's Comet, but they are planning the next best thing. Columbia is due to take an astronomy payload designated Astro-1 into orbit early in March 1986 and one of the mission's objectives will be the observation of Halley's Comet. This will be the first of a series of Astro missions designed to make astronomical observations.

Astro consists of three specially designed ultraviolet telescopes and two wide-field cameras. The Astro instruments will be carried on a pair of Spacelab pallets and will use the Spacelab Instrument Pointing System. The payload will also include a large communications satellite, Intelsat VI-1.

Solar System exploration continues in May 1986 with the launch of two important probes. The first of these will be the International Solar Polar Mission, now renamed Ulysses. The spacecraft will be carried into earth orbit in the Shuttle's payload bay attached to the new Centaur G-prime liquid-fuelled launcher. Once it has been deployed by the Shuttle, the Centaur will fire to put Ulysses on course for Jupiter.

After a 14 month journey, the gravitational field of Jupiter will be used to swing the spacecraft out of the plane of the ecliptic (the plane of the earth's orbit). Two and a half years later Ulysses will pass over one of the poles of the sun, before crossing the ecliptic again and heading for the other pole. The whole mission will last five years.

Ulysses is a joint NASA/ESA mission. ESA is responsible for construction and operation of the spacecraft and for half of the experiments. NASA is providing the other half of the payload and is also responsible for the launch.

One week after Ulysses heads for Jupiter it will be followed by a spacecraft to study the planet itself, Galileo. In fact, Galileo consists of two spacecraft, an Orbiter and an atmospheric Probe.

Galileo is due to arrive at Jupiter in August 1988, but 150 days before this the Probe will detach, ready to plunge into the atmosphere. Slowed by a parachute, the Probe will relay information about the Jovian atmosphere until it is finally crushed by increasing pressure.

Once the Probe has done its work, the Orbiter will begin its 20 month long survey of the Jovian system. This will include close encounters with 11 of Jupiter's satellites.

Galileo, like Ulysses before it, will use the Centaur G-prime to place it on course for Jupiter. In order to carry the Centaur, the Shuttle has to have access holes cut into the payload bay doors. This is to allow the Centaur to be fuelled on the launch pad. Only two Shuttles, Challenger and Atlantis, are to be modified in this manner, so it is these two vehicles which will carry Ulysses and Galileo into earth orbit.

The Hubble Space Telescope will also be deployed in 1986 and the present schedule calls for an August launch.

One aspect of the Shuttle programme NASA is keen to stress is its flexibility. This was demonstrated when the first two missions of Discovery were combined after the June launch aborts. In reality, this flexibility means that launch schedules can change from one month to the next. Whilst the information given in *Shuttle Update* is correct at the time of writing, there is no guarantee that any of these missions will fly as listed.

COMPUTERS

The Greedy dwarf. Goldstar. £9.95.
Riches without measure and the title of King's Adventurer are on offer to who recovers three gems and evidence of the thief Arfa's death in *The Greedy Dwarf.*

Arfa has hidden the jewels in separate chambers and has attempted to ensure their safety by a variety of unpleasant devices, including rats, spiders, shadow monsters and a giant evil hound.

Your task (if you choose to accept it!) is to recover a ruby, a diamond ring and a sapphire scarab before your lamp goes out.

With only 65 locations this is a fairly short adventure but completing the course is made difficult by your inability to carry more than four things at once (including the lamp) and if you make more than five wrong moves your lamp will go out before you can finish.

Every object used once only – with just two exceptions and has a specific purpose, even if it is not obvious for many moves.

All this has the effect of making a great deal of backtracking necessary as you can't carry everything first time through – so mapping becomes essential.

Although exciting enough to keep your interest throughout 'Greedy Dwarf' is perhaps disappointing in that Arfa never retaliates however much you bash him in battle. Even more disappointing is when, task completed you stand before the king to present the rescued treasures. All you get is a gold medal – so perhaps the king is greedy as well.

Instructions are entered in short simple English sentences and loading is quick and straightforward. A judicious use of adverbs often facilitates your passage when all else fails.

A useful feature of the program is that the red function keys on the BBC B red function keys have been defined to save wear and tear on your fingers.

Overall a well-written adventure, with no apparent bugs. Easy to play but not too easy to solve.

JB

Adventure Quest, by Level 9 Computing. £9.00. Text only.
This is a Middle Earth based adventure. You, a poor, under-60 year old apprentice magician who has never cast a spell in earnest are called upon to haul the fat out of the fire and find the four stones of the elements and defeat a particularly unpleasant Demon Lord.

This is an amusing game in its repartee, given when the adventurer does something silly like getting eaten twice in a row by a giant worm, but with 255 locations it is also a game to be reckoned with in terms of adventure. I do like games which make me laugh and this is one of them. With imagination you can conjure up some wonderful mental pictures of some sections. At one stage I found a kitchen table and decided to take it along with me. Through numerous reincarnations onto the top of a mountain surrounded by puffs of orange smoke I seemingly kept plodding on, with this table (I did need it though, to reach the orchid!)

Level 9 offers a useful service for totally stumped gamers, with a special question card in a supplied envelope to be returned to them via the magic of the Post Office.

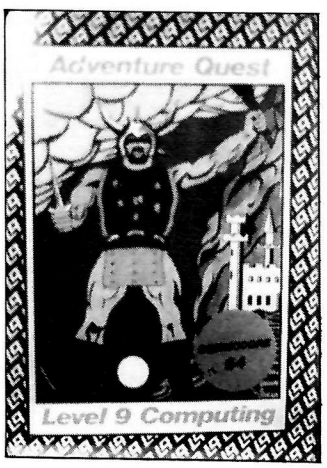
Like all Level 9 games this is a long and complex adventure and it is one for careful mapping on long dark winter evenings.

The booklet with the cassette is well written and helpful, if enigmatic at times 'Almost everything in Adventure Quest has a purpose: If only to keep you trying to work out its purpose'.

It is an adventure where you feel you are pitting your wits against a humorous opponent programmer.

WG

Twin Kingdom Valley. Bug-Byte. £7.95.
Twin Kingdom Valley has been around now for about a year on the BBC and the Commodore 64 but now the 150 location drawings have been squashed into the Spectrum's 48K memory by Bug-Byte, and in a move to make BBC and Commodore owners gnash their teeth, the Spectrum version has more pictures, and all locations are described in full by text and speech through a Currah Microspeech unit, if you've got one.



Twin Kingdom is a jolly sort of an adventure, straightforward in that there are none of the 'you have to light the green and red striped candle, not the pink and yellow one if the monster ten moves on isn't going to get you' sort of manoeuvres. You do have to remember to get the flint from the quarry as quickly as possible otherwise it vanishes in a puff of programming sometimes and you can't get much further because you can't light your lamp, but other than that it is an honest adventure. I liked some of the programming touches. (This review was written after playing the '64 version) such as your strength going down after drinking the beer at the Sword Inn.

It is certainly a user-friendly programme, as even my children have spent hours travelling the Kingdom unaided and with enjoyment, and as adventure programmes go it is remarkably good value.

I confess that I haven't got anywhere near the end, but that is probably simply because I haven't had the time to concentrate on the adventure as yet, and not because I don't want to. The challenge level is about right.

Special tip for Spectrum owners – Bug-Byte tells me that if you enter *! while playing the program will cycle through most of the pictures, displaying each for about 10 seconds. Hit any key to return to the game.

WG

64 Tape Computing, from Argus Press Software. Two-monthly. £3.99.
Astute *Voyager* readers will spot that this cassette-computer program/magazine hybrid is published by a member of the same group of companies as *Voyager,* but cease your cries of nepotism!

I've run/read three copies of the magazine and pronounce them, without fear or favour, to be excellent value for money.

Issue two, for example features a single colour sprite editor, a Pac-Man doppleganger called Punkman, ditto for a Space Invaders game called Defend, a Hi-resolution graphics designer and a full text-only adventure game, Spaced Out, which reveals that the Editor has an excruciating taste in puns.

Covered in other issues are arcade style games, music programs (I tootled away merrily for ages with this one) and another adventure game, this one western-based and equally punny called 'True Spit'.

As a change from most bought programs, all on these tapes can be listed and studied, so that youngsters can see how they are constructed, and I found only one bug in all three issues, which isn't bad considering the number of programs, all especially written.

In all, at 50p a week, a good investment for a youngster wanting to build up a legal tape library, with a mixture of games and hard computing programs. I'll certainly be looking forward to future issues. The magazine is also available for other home computers.

WG

The Time Machine. Channel 8 Software.
This could have been quite a good adventure game. Emphasis on the *quite good* however, for the basic adventure plan is let down by some distinctly quirky programming which has the player reaching for the sponge mallet in frustration. Too often I knew exactly what I had to do to progress but because I couldn't hit on exactly the right two-word input I was left seething.

I'm no computer programmer but it seemed to me that none of the by-ways so necessary to liven up an adventure had been explored or catered for. My impression was of a very rigidly planned route with no thought as to variables.

The instructions aren't much help either – basic loading instructions only with no details on words in the memory, or special functions, so that a newcomer to adventure games would not discover 'inventory' (which has to be entered in full by the way) for example and no instructions for

changing the top half of the screen from graphics to text – with the result that as I started to play I kept getting 'something happened' messages and until I discovered you have to hit return to get the text and find out what happened from the top next I was blundering about frustratingly.

At one stage I spent about half an hour trying to find the magic word formula for switching on my torch and in the end gave up, ringing Channel 8 the next day (it is light flash by the way). When playing again to refresh my memory on writing this and finding I needed to jam a lever and spending another half hour trying to convince the program without success, well, I've just given up . . .

WG

The Patrick Moore Astronomy Program. Commodore UK. £9.99.
This program has been produced by our own contributor Patrick Moore via Ivan Berg Software and Commodore and is a splendid example of educational software.

The best parts are the displays of starfields, allowing you to view the night sky to the North or South. The maps are calculated for the first of the month and display the stars visible from London at 10 pm GMT.

You can select stars, constellations and months, and manipulating keys will allow you to identify each, so that you can bob back and forth between computer and outdoors and quickly learn what's what up above.

Two more sections give information on the planets of the solar system, then comes an astronomical glossary of over 100 terms and finally a quiz which fires 20 multiple choice questions at you.

This program is just the job for those who are confused by all the maps in books, when trying to learn their way around the heavens. It is supplied either on disc or two cassette tapes.

WG

Rapscallion. Bug-Byte. £6.95.
Rapscallion, a new game from Bug-Byte, turns you into a bird or a fly depending on your choice. You have got that way because the evil Rapscallion stole away your magnificent castle. Your task is to find the magic wand that will get rid of him forever, and return your name to the title deeds. The game is set out in an unusual format, in that you do not have to complete screen one to go to screen two. If you fly off the edge of one screen you appear on another.

There are three stages to this enjoyable game. Stage one has you in the 'wilderness', from which you must escape. To do this you need the help of two pixies (but you don't know which two), who will enable you to get the key to the 'magic labyrinth', stage two. In stage two you have to find just one pixie, who will help you locate three sleeping wizards, who will give you the key to stage three, the 'castle'. Once inside the castle, nasty Rapscallion and his guards will be on the look out for you, and if they catch you, will kill you. Using many secret tunnels, you must locate two genies who will enable you to find the magic wand, which will make you 'king of the castle' once again.

The game itself is very well thought out, and runs smoothly on the screen. The graphics are well defined, although the Spectrum's capability of only having two colours in the same character spoils them a little. What makes the game even more enjoyable, is the fact that you don't have to worry about either firing buttons or time limits. However if you decide to save a game onto a tape, you cannot get the title deed, only a leasehold. A good game from Bug-Byte. A great deal of variety in it, not just blap the alien.

DB

PRODUCTS

Star Trek episodes 'Miri' and 'The Empath' and 'Plato's Stepchildren' and 'Whom Gods Destroy' on two videos, issued by CIC in their Arena series. Dealer price £22.50 each, excluding VAT.

Or, 'CIC goes boldly where no BBC would go before' and it *is* a shame that the BBC hasn't shown these four episodes, for without a doubt they are among *Trek's* finest, in terms of not only plot and performance but also because they in many ways epitomise the best in *Trek* – good entertainment but also underneath, some strong thoughts on humanity and the way we live.

'Plato's Stepchildren' for example on the surface notches up what is credited as TV's first inter-racial kiss between Kirk and Uhura and also the first inter-spacial one, twixt Spock and Nurse Chapel. But underneath that there is the idea, strong in *Trek* of 'we shall not kill . . . today' plus comments on the desirability or otherwise of power and revenge. The story, by Meyer Dolinsky, was a lift out of the running down of the third and last series (which also gave us *'Spock's Brain'*).

I'm told by the BBC that they will be looking again at whether to broadcast these four episodes, and by the time this appears a decision may well have been taken, but if not, and they are still worried on content, why on earth can't they schedule them for screening at a later time and solve the problem. In the past it has never seemed to worry the BBC when they show *Trek* – the alert fan has learned to scrutinise the listings for each and every time and day. (As I write *'The Menagerie'* has been dropped in today (Tuesday) at 5.10 pm, after being dropped from last Monday in favour of the much more harrowing for children *King Kong*).

Still, if you haven't seen these episodes it is most certainly worth looking round to find a dealer who has them on rental. If nothing else you can sit back and wonder at Auntie's reasonings . . .

WG

Alpha Dawn and Knight Hawk Role Playing Games from TSR. Boxed sets at £9.50 each, add-ons about £4.50 each.

At last! TSR is boldly going where just about every other games company has gone before – into general purpose Science Fiction Role Playing Games in the 'Traveller' genre.

TSR has produced other SF games in the past. They produced the first one, Metamorphosis Alpha followed by Gamma World. However, these games were set within well defined boundaries and didn't allow for major variations in play.

Star Frontiers is available in two parts:- Alpha Dawn and Knight Hawks. (They can be played independently.)

Alpha Dawn is the Role Playing Game. What you get for your money is:-

A basic rule book (a sort of idiot's guide to RPG's), an expanded rule book, two full colour maps (wow!), a sheet of coloured counters (interesting?), two 10-sided dice, and an introductory adventure.

Players have the choice of four character types which consist of:

1) Human (stupid dumb monkey-man who doesn't know any better).
2) Dralasite (shape changing blob).
3) Vrusk (85 kg intelligent insect).
4) Yazirian (man-sized gliding ape).

Alpha Dawn is a good basis for the inexperienced who would like to try SF RPG-ing. However, for the more experienced gamers Alpha Dawn leaves a little to be desired in content because it is set in an heroic, fun, silly universe. The game is apparently not based in any true form of 'reality'; players can receive multiple hits from guns, lasers, rockets and so on, and still remain standing. It is a hard transition for the experienced gamer to come down to the level of Alpha Dawn when used to the more realistic Traveller-style game.

This game requires careful refereeing because pre-generated adventures have specific paths for the players to follow. If they deviate from this they could well miss vital information which may be needed to save their lives. I have gamed for eight years and have never seen an adventure proceed in the order that the designers anticipated. This is because the players are free-willed individuals who hold fate in their own hands, claws, pseudopods, etc.

After countless hours of consideration and debate the verdict that we came up with is that Alpha Dawn is a superb game for people who are aged fourteen or less, or if you are an experienced gamer it is a good game if you have had a hard day and don't want to think.

It was a pleasant surprise therefore to read Night Hawks. I was a little wary after evaluating Alpha Dawn but was amazed when I came to play Hawks. It is a good game.

Hawks costs the same as Alpha and can be played independently. It consists of a 64 page RPG expansion rule book, a 16 page board game rule book, a mind blowing $22\frac{1}{2}$ inch by 35 inch hex sheet, an introductory adventure for the RPG 285 colour counters, and two 10-sided dice.

These rules are well worth the

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money. They are well laid out and thought out. The game is a joy to play. The rules consider all forms of starship life, finance, prospecting, mining, piracy, sabotage and incredibly useful emergency procedures section (quite a few characters survived because of this). The methods for ship design are simple and efficient. Also included are understandable 3-D space flight/combat rules.

When I ran this game I was faced with players who had 'suffered' Alpha Dawn. By the end of the night they were joyful. The game had been lively, interesting, tactical and fun !

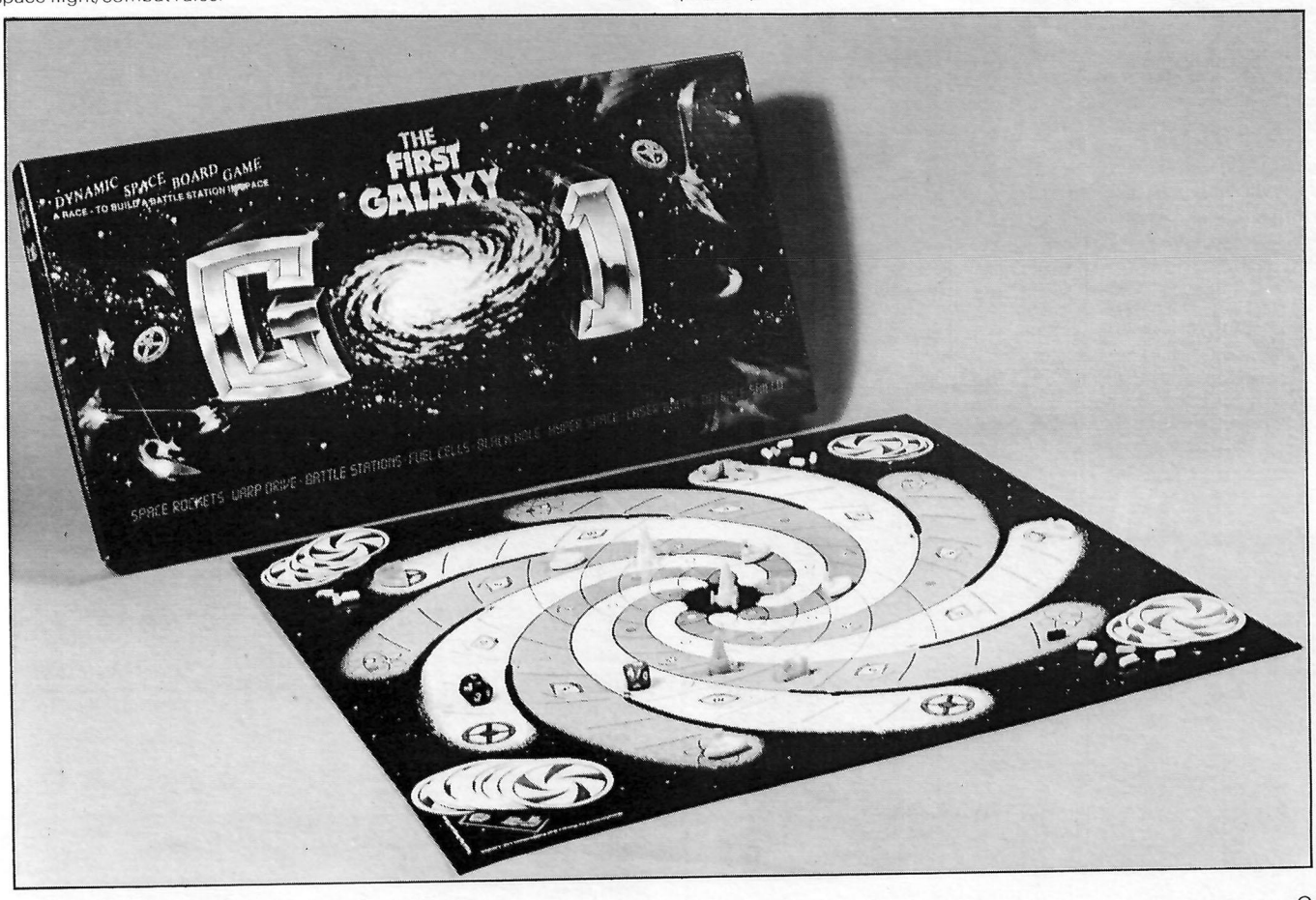
Congratulations go to Doug Niles who designed Hawks and the players' commiserations go to the TSR design team for Alpha Dawn.

HH

In the beginning there was void. Then eruption – the Big Bang scattered atoms across the universe. Galaxies formed and reformed and the first of these was G1.

Now five races seek domination of the Galaxy. To do this they must build a battle station from four sections spread across the vast emptiness of space and dock their spaceship with the station.

The game itself is remarkably simple to learn and contains rules for two levels of play – simple and not-so-simple. The board – for which Greg Houlgate, who designed the game, won a minor graphics award – represents the galaxy, with a 'black hole' at the centre and 10 spiral arms radiating out to the various 'home-bases'. These arms are crossed to form 'squares' and are littered with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fuel depots, repair docks and supply depots. Each time a player lands on a fuel depot, they collect 10 fuel cells; repair docks offer shelter from marauding enemy vessels in the vicinity – but cost the visitor either five or 10 fuel cells; landing on a supply depot entitles the player to draw a supply card, which may grant them more fuel, laser weapons, warp drive etc. There is also a 'Sploj' card. The Sploj is an interstellar hitch-hiker who lurks around supply depots, waiting for an unsuspecting ship to give him a free trip round the galaxy, and is worth a single fuel cell if you're lucky!

To start, each player has to emerge from the black hole and travel to the relevant squares on the board to collect the four quadrants of their battle-station. Players may hinder each others' progress in a number of ways; by landing on an enemy's rocket or shooting it with lasers (which may be deflected with a 'shield' card) a player can send his opponent hurtling into the black hole – where they must stay for one round.

Fuel is a vital consideration in the game, as it is expended with every move and at varying rates. Often it must be surrended to another player or "The Watcher" (effectively the bank cf. Monopoly). Each player starts with 50 fuel cells, more can be obtained from the fuel or supply depots – or by more devious means.

In an emergency a player may sell supply cards to The Watcher for five fuel cells each – except the Sploj card, which seems to be a permanent encumbrance.

All told, this game – for two to five players – represents very good value for £7.99. Easy to learn and strategically challenging – especially when all five 'teams' are playing, it has hit the market at just the right time. The rules, as we have said, may be used at two levels of difficulty; the simple style dispenses with such complexities as fuel cells and supply cards so even adult life forms can play!

C.R.

Crosstrap, by Tactix, boxed boardgame, priced at £6.99.

First thoughts on opening the box and contemplating the contents; – 14 playing pieces shaped like bitsy plastic cones, plus board and rule leaflet. 'hmmmmmmm this game is nothing'. Reading the rules does nothing to enhance this opinion. It's all too easy.

But, and it is a big but, the moment you start to think about your first move you begin to realise just how sneaky you have to be to get anywhere.

In fact Crosstrap has all the makings of a very good and very popular game.

You start off with 14 pieces – 12 penetrators and two infiltrators and the object of the game is to get one of your penetrator pieces through the enemy lines and into their 'command centre'. Each player has four moves per go, to be distributed among all his pieces and you take by bracketing the enemy men. Sounds easy, but you sure learn how to count the numbers between one and four very quickly.

It isn't the sort of game which requires the wholehearted concentration of chess, you can contemplate the universe – or the TV – while your opponent moves, but you have to think hard while it's your turn.

Since Harrods have decided to carry the game, if you also get hooked (and I have a feeling it is possible) then you'll be in the company of the best people!

Game inventor Maurice Ronin has challenged computer programmers to translate his game into bytes. £100 reward is on offer to the first to succeed. Warning to hopefuls – there are, I'm told, over 10 000 possibilities in the first turn alone.

If this game is produced in a portable version it could go farther. It would be ideal for such things as train journeys.

WG

Reviewers this month
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DB – Darren Butterworth
MF – Mils Fabricus
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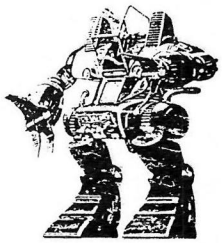

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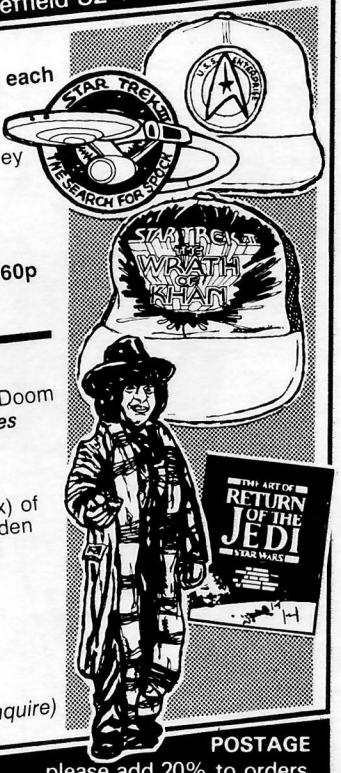

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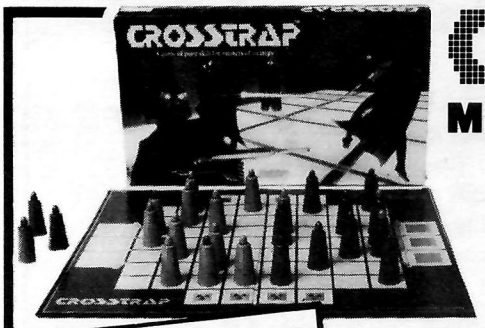

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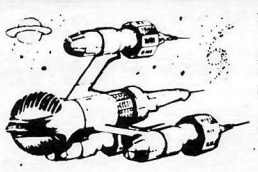

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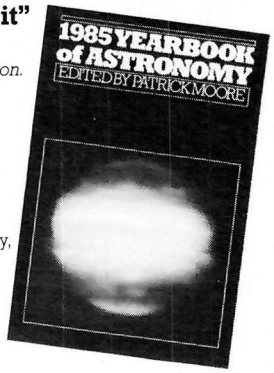

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3. Proof of posting will not be accepted as proof of receipt. Whilst every care will be taken, the publishers of *Space Voyager* cannot accept any responsibility for lost entries.
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SHOCK·WAVE

AN ASTRONOMICAL THEORY.WHICH ENCOMPASSES EVERYTHING FROM THE FORMATION OF STARS TO WHY HOUSES GET DUSTY HAS GOT TO BE SOMETHING SPECIAL, AND FUTURES CORRESPONDENT ANDREW NIMMO'S THOUGHTS ON WHAT'S HAPPENING IN THE UNIVERSE CERTAINLY CLICK TOGETHER.

There are probably only one or two hydrogen-molecule-sized particles per cubic centimetre out in the space between the arms of our galaxy, but in dust clouds this will go up to around 30,000 particles per cubic centimetre, and in those in the galactic spiral arms themselves, densities are expected to range between 100,000 and 10 million particles per cc. Accordingly, it is believed that as stars orbit the galactic centre, they will create shock-waves during their passages through such clouds, just as Earth does in its passage through the five particles per cc solar wind, on its orbit round the Sun. At present, our Sun's shock-wave is expected to be found at around 100 AU or 'astronomical units', which means 100 times the Earth's distance from the Sun.

The Sun orbits the galactic centre at 250 km per second, so each square centimetre on the leading part of its shock-wave can be expected to sweep up between $2\frac{1}{2}$ and 250 trillion particles per second while passing through the dust clouds in the spiral arms. Even such vast numbers would still only weigh a tiny fraction of a gram, quite insufficient to breach the vast shock-wave, but as the shock-wave might be expected to curve out and backward along the direction from which it is travelling, the particles would be expected to flow backwards along it. Next second, another large number of particles would be swept up on top of the flow, and so on.

While particles are seldom in collision in interstellar space, it wouldn't be long before they did so on such a shock-wave's surface. Stickier atoms would grab hold of each other and it wouldn't be long before carbon dioxide and water ice snowballs began to build up and roll along with the flow. At the far end of the shock-wave they'd tend to become elongated and break up into a spatter of ice particles flowing off behind, perhaps to land on the shock-wave of some following star and build up further.

In galactic arms there are large standing shock-waves that belong to the arms themselves, rather than to passing stars. When a star meets one of these, the snowballs on the leading part of its own shock-wave will be pressed through it by the compression resulting from the collision of the two waves.

In the Halley Lecture, in May 1975, Professor W H McCrae proposed that comets were formed in a similar manner to this. It is not the formation of the comets however, which concerns us in this article, but the implications which derive from this. Accordingly, I'd suggest at this point that readers briefly remind themselves of some of the pieces in the cosmic jig-saw before reading the following sections. With the aid of *Space Voyager's* artist, these have been laid out in panel form on pages 70 and 71.

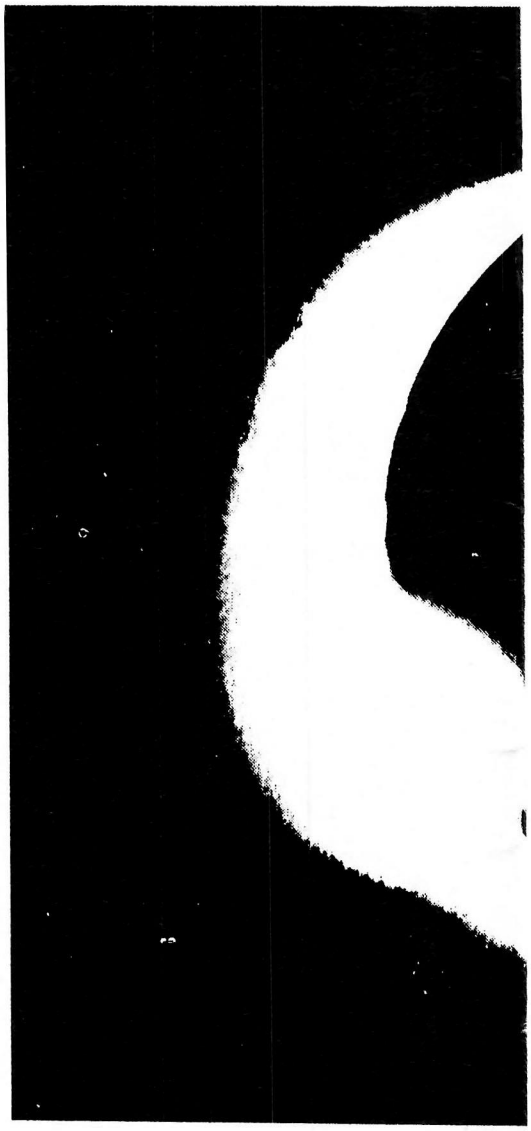
Cold-Cometary Creation

Once inside a star's shock-wave, comets would take up orbit around the star, and after it left the galactic arm the comets would be carried with it, thus adding to the mass of its system. If you imagine a single star without planets, after its first encounter with a galactic arm it would have gained many comets. How far out they'd be would depend on how far in the star's shock-wave had been compressed at the time of the collision with the standing shock-wave. Their orbits would almost inevitably be eliptical, whereby part of the orbit would involve a stronger pull towards the star's gravity centre than would be present further out. During the millions of years of the star's travel between galactic arms, this would inevitably lead to the comets' orbits decaying one by one. So they would find themselves passing closer and closer to the star as time went on.

Each time a comet passes close to a star, some of its matter boils off. Hydrogen would do this first, then carbon compounds, water ices, silicates, sulphides, potassium compounds, phosphides, and metals. On the way out materials would freeze in the reverse order. Near the star, a disk of miniature gas and dust particles would begin to settle in to the star's ecliptic plain. As more and more comets pass inwards shedding chemicals this disk will grow outwards. The nearer the star it is the more mixed it will be, but beyond this, rings of sulphides, silicates, then water ices followed by carbon compounds and finally hydrogen ice crystals, will form.

Most particles will never meet another, because even within a solar system, distances are vast, but those particles which do meet will probably simply bounce off each other again. This will probably continue until the disk expands outwards sufficiently to form its first carbon compound ring, most likely carbon dioxide. Here, carbon molecules will have more chance of meeting each other. Carbon molecules each have six hands. If one grabs the hand of another, they become a piece with ten hands. This means that collisions make them more sticky, rather than less. Further in, the hands would tend to be grabbing solids which would encrust the molecules and make them less sticky. In time therefore, asteroids could be expected to accrete in the first carbon ring.

Sooner or later, a whole comet would have an orbit which decayed in such a way that almost all of it was in a carbon compound ring.

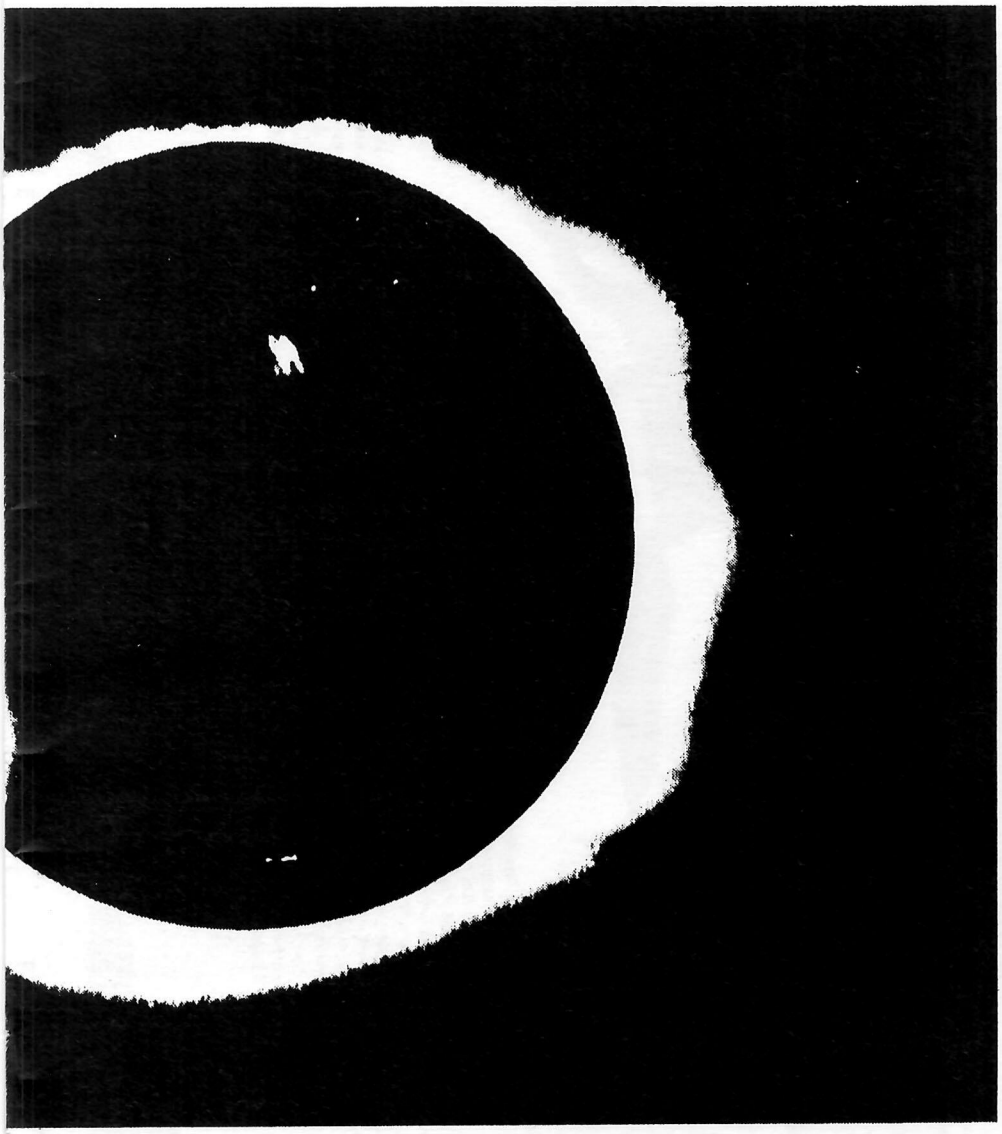


This would build up quickly, possibly to small planetary proportions. In time, our star would be surrounded by rocks of differing sizes. Its own mass would also increase as it would swallow a number of comets due to its gravity.

Newton's laws of gravitation tell us that the greater the masses of bodies, the greater is their gravitational attraction. As our star and its rocks accrete the rocks will therefore tend to be drawn in towards it.

A rock will tend to accrete from three directions. Cometary particles travelling inwards, particles travelling outwards and particles swept up from the direction in which it orbits its star. Material swept up will add a negative velocity to its orbital velocity, slowing this down and thus causing it to drop into a lower, closer orbit where increased gravity will speed up its orbital velocity to an even greater rate than it was before.

ASTRONOMY



The star's own gravity will tend to act to detract from the numbers and velocities of collision particles travelling out however, and to add to numbers and velocities of those going inwards. On balance therefore, rocks should receive more direct push inward than outward. Evidence indicates that our Sun takes about 3 million years to pass through one of the galactic arms, so it would seem feasible that enough mass could be brought in during that time to provide enough continuous accretion for our Sun's gravity to cause the bodies in our Solar System to perpetually spiral inwards.

At present, micrometeorites come in to Earth at about 35 million kg per day, adding whole comets and larger meteorite impacts, we end up concluding that in the whole 4500 million years since the oldest rocks on the Earth's crust were formed, Earth has apparently only accreted a couple of 100,000ths of our planet's mass. Continental drift, vulcanism and weather obscure much relevant evidence on Earth, however, and there are indications from lunar investigations, that meteorites can come in splurges. It may be therefore, that we receive a much higher deluge of them while actually in the spiral arms. Further examination of lunar and asteroid surfaces will make this clearer.

If present levels of accretion are average, and Earth was formed wholly out of such accretion, it would have taken 450 trillion years to grow to its present size. Most scientists don't believe the universe has existed more than 15 billion-years, 30 billion at the most.

Smaller bodies should accrete less and so spiral in less rapidly. This means that the lunar evidence indicating the Moon to be 1,000 million years older than Earth could fit. The carbon rings are out beyond Saturn, so all inner bodies would have spiralled in from there, and the Earth could have captured the Moon en route. Both could have passed through the asteroids, which with the Moon's lack of vulcanism compared to Earth's, might explain its appearance. As asteroids would be spiralling in slowest, one would expect that all the inner planets must have passed through them, whereby the asteroid belts were probably a great deal thicker originally than they now are.

If on examination, the surface of the planet Mercury were to prove to be much older than either the Moon or Earth, we would have some substantial confirmation as to whether or not our Solar System planets were formed in this manner. Asteroids should be even older, and moons of outer planets ought to be much younger.

Planets forming later, after the outer rings had a chance to build up density, would be expected to be much larger. A comet orbiting in a dense hydrogen ring would pick up an enormous quantity of such very light material, hence planets such as Jupiter and Saturn, which are not only giants, but mainly hydrogen.

It is also interesting to note that Jupiter, which is just about to leave the water ice ring, has lots of water in its atmosphere, while Saturn, just entering the water ice ring, has virtually none. Venus, in the sulphide ring, has sulphuric acid clouds, and Earth, just entering the sulphide ring, has a population of beings wondering where things such as acid and yellow rain are coming from!

When *Space Voyager's* new editor, Wendy Graham, first discussed this with me, she asked if that meant the dust in her home came from outer space, and we discussed why archeologists have to dig so deep for ancient remains. It is certain that most of the dust in Wendy's home *does* come from space, though air currents probably blow it there, and while wind and water movement tend to cover up ancient artifacts, along with subsidences etc, don't let's forget that almost every raindrop carries a dust particle, and these do come from space. Apart altogether from shock-wave astronomy, most scientists believe that every atom other than hydrogen atoms, is created in fusion powered stars. We are made out of star-dust, you and I.

Shock-Wave Creation

If one of the little ice spatters mentioned earlier flows off the tail-end of a star's shock-wave, later lands on another and accumulates some more mass, then repeats this process a number of times, it may build up to quite substantial proportions. Sooner or later it may become big enough to break into a star's system without a galactic shock-wave to push it through the star's own shock-wave, but if it doesn't happen to meet another star, because it has received impetus from its initial shock-wave encounters, it'll continue to orbit the galaxy on its own, even if at a somewhat slower

The COSMIC ZIGSAW

1785 – The Galaxy.
Sir William Herschel made calculations which demonstrated the existence of the galaxy.

1798 – Black Holes.
French astronomer, Laplace, suggested that there may be stars so gigantic in mass that their gravitational fields would have escape velocities greater than that of light, whereby nothing, not even light itself, could get out of them. The idea of Black Holes was born.

1826 – Olbers' Paradox.
German physician, Olbers, posed the question, 'Why is the sky dark at night?'. Stars do increase in dimness with distance, but numbers of stars in any particular direction increase in reverse proportion with the same distance. This means that the whole sky should be as bright as the Sun. Olbers thought the interstellar dust clouds might provide an answer, but it was shown that these would absorb energy and become white hot, whereby we should still receive radiation equivalent to about 150 000 Suns. This is 'Olbers' Paradox'.

1838 – White Dwarfs.
German astronomer, Bessel, detected gravitational perturbations in the movements of the stars Sirius and Procyon, indicating possible invisible companion stars – Sirius B and Procyon B.

1862 – White Dwarfs.
American astronomer, Clark, discovered that Sirius B & Procyon B were visible but very dim.

1893 – Star Classification.
German physicist, Wein, showed that the nature of light varies with temperature in such a way that by studying wavelengths of light-sources one can deduce the source temperatures.

1905 – Special Relativity.
Swiss patent officer, Einstein, produced his 'Special Theory of Relativity', which predicted antimatter, time travel, elasticity of space and time, equivalence of mass and energy, and the creation and annihilation of matter.

1913 – Star Classification.
American astronomer, Russell, following a line indicated by Danish astronomer, Hertzsprung, drew a graph of temperature and brightness of stars, now known as 'The Hertzsprung-Russell Diagram', which showed that most stars fall on a diagonal known as the 'main sequence'. Letters and numbers allocated according to temperature provide ease of reference. The memnonic, 'Wow, Oh Be A Fine Girl, Kiss Me Right Now Sweety!' reminds that the letters are: W,O,B,A,F,G,K,M,R,N,S, though the 'W' or Wolf-Rayet stars are very peculiar and maybe shouldn't be there. There are also doubts about R,N, and S. Numbers indicate further division whereby a sector would read: F7, F8, F9, G0 G1, G2, G3, etc. Our Sun is thought to be a G2 star.

1915 – White Dwarfs
American astronomer, Adams, managed to pass light from Sirius B through a spectroscope and study its wavelengths. He found it to be as hot as our Sun in spite of its dimness. To explain this, he assumed it must have a very small surface area, whereby it had to be very dense to produce the observed gravitational perturbations in Sirius A. Other stars seem to be similarly dense for similar reasons. These are called White Dwarfs.

1916 – General Relativity.
Einstein produced his 'General Theory of Relativity' which showed how black holes could be formed, how light travelling through an intense gravitational field, such as that near a black hole, neutron star or white dwarf, would be shifted towards the red end of the spectrum, and predicted that space and time would be found to be curved.

1917 – Expanding Universe.
Dutch astronomer, de Sitter, pointed out that apart from the static universe which Einstein had been considering, another kind would fit his equations. This would be one in which the overall density of matter was constantly decreasing with time. He suggested that a universe which was expanding, would fit this criterion.

1925 – Stellar Movement.
Dutch astronomer, Oort, showed that in our galaxy, stars orbit the galactic centre, and that they do so faster, the closer in towards it that they are – in other words, they are all spiralling inwards.

1925 – White Dwarfs.
Adams discovered Sirius B's red shift to be precisely as Einstein had predicted for objects of such density.

1927 – Quantum Theory.
American physicists, Davisson and Germer, conducted experiments to prove 'Quantum Theory' which showed that either there are an infinite number of serial universes, or that particles in this universe continually oscillate between reality and unreality.

1928 – Red Shift.
American astronomer, Humason, following a line indicated by fellow American astronomer, Slipher, showed that all galaxies outside our own local cluster had the wavelengths of their light red shifted when examined through a spectroscope.

1934 – Neutron Stars.
Swiss astronomer, Zwicky, proposed the existence of stars made of neutrons tightly packed together, whereby a sphere of them, 10 miles in diameter, could contain the mass of a star. This was the birth of the concept of the 'Neutron Star'.

1927 – Big Bang.
Belgian astronomer, Lemaitre, proposed that the red shift indicated that at one time all the material in the universe was in one place, which he called 'the cosmic egg'. This was the origin of what is now known as 'The Big Bang Theory'.

1929 – Red Shift.
American astronomer, Hubble, said that the further away a galaxy is from ours the greater is its speed of recession from us, and hence the greater its red shift will be. Accordingly, astronomers calculate distances of galaxies by the measure of their red shifts. This is known as 'Hubble's Law'.

1939 – Neutron Stars.
American physicist, Oppenheimer, worked out that at least in their initial stages of formation, neutron stars would emit a profusion of x-rays.

1950 – Comets.
Oort proposed that there was a vast cloud of comets forming a shell around the Solar System, about a light-year out. Every so often, the gravitational perturbance of some passing star would deflect one or more of these inwards to closer orbits.

1938 – Stellar Energy
German-American physicist, Bethe, pointed out that the quantities of energy needed to produce observed stellar phenomena could only be produced by either nuclear fission or fusion, and that without regular injections of extra mass, our Sun could not have lasted as long as it has by fission, and as there was no sign of such incoming mass, stars must be fuelled by fusion.

1964 – Red Giants.
It was discovered that many red giant stars have atmospheres which are cool enough to be rich in water vapour.

1948 – Steady State.
British astronomers, Bondi, Gold, and Hoyle, proposed 'The Steady State Theory', based on Einstein's work, this suggested that galaxies reaching velocities of recession greater than the velocity of light in a vacuum 'leave' our universe, and that new galaxies are created all the time to replace them.

1958 – Van Allen Belts.
American physicist, Van Allen, deduced the existence of radiation belts around Earth after apparent failure of a radiation counter on US space satellite Explorer 1. The belts appear to be held in place by Earth's shock-wave as it orbits the Sun through the Solar Wind

1968 – Pulsars.
British astronomer, Hewish, announced the discovery of four pulsars – stars which pulse regularly in microwaves. A few months later, Gold showed that these were neutron stars, and predicted that they should also flash in other wavelengths.

1965 – 3K Radiation.
American radio astronomers, Penzias and Wilson, discovered radiation at a temperature of 3°K, apparently coming in from all directions.

1969 – Pulsars.
It was discovered that the Crab Nebula pulsar flashes in lightwaves as well as in microwaves.

1974 – Bok Globules.
Bart & Priscilla Bok proposed that a certain type of globular dust cloud which exists in space, now known as 'Bok Globules', was a star-forming cloud.

1975 – Comets.
British cosmologist, McCrae, proposed that comets are formed in large numbers out of dust captured and compressed by our Solar System's passage through the dust clouds and standing shock-waves of galactic spiral arms.

speed than the stars. When it passes through a dust cloud it will add a little extra mass, and in the long pass through a spiral arm it may add quite a bit of mass. If the universe lasts that long, in a few quadrillion or quintillion years it should build up enough mass to become a small single star itself.

Some trillions of years later, it'll have its own planetary system, and in time it will become a star with a large dense outer hydrogen ring. Gas giant planets will form further and further out around it, and sooner or later one will be close enough to its shock-wave to project a substantial gravitational shadow on this. This will amount to an indentation in the star's shock-wave caused by the proximity of the planet.

By the time the ring gets far enough out for planets to have such an effect, it will be pretty close to the shock-wave. At the next pass through a galactic arm, the ring may breach the shock-wave, at which point vast numbers of particles would accumulate, particularly in the indentation. This would form not a planet, but a new star, and we'd have a double star system.

This new star, out at the shock-wave, would quickly form its own shock-wave, and the two would appear as a sort of double humped affair, with a trail of spattering ice particles trailing away down both sides between the humps, from swept up interstellar dust. By the time the two stars reach their next pass through a galactic arm, these twin trails of ice and gas will be very long, even if diffuse due to the paucity of particles between the arms.

At the point where the two stars go through the standing shock-wave their twin humped wave will probably smooth out into one larger shock-wave covering the systems of both stars. The twin trails of ice and gas would be instantly cut free. Their front ends would also be slowed somewhat, by the standing shock-wave, but as all of the particles in both trails would have received some impetus in the direction the two stars were travelling, these particles in the long trails would catch up with their leaders. They would ball up into two almost identical twin stars.

If I am right on this, then every couple of near identical twin stars should be following the galactic orbital path of a couple of non-identical double stars, even if some way behind. Any astronomers out there like to check this out and let us know? So far as I know, this is the first explanation for the existence of identical twin stars yet put forward.

Implications

The most important implication arising from all of this is the fact that stars will continually accrete mass as a result of every pass through a galactic arm. This means that stars must rise up the main sequence of the Hertzsprung-Russell Diagram. Contrary to astronomical thought, a G type star will not stay a G type star. It will not become a red giant and then a white dwarf, as presently believed. All stars will commence at the bottom end of the sequence and work their way up. The present astronomical view that 'B' stars and 'O's are young stars is totally wrong. They must be old stars which have worked their way up to Bs and Os through billions or trillions of years. Further, all stars, or certainly almost all stars must become black holes.

Any star of 3.2 times our Sun's mass will become a black hole in time, according to theory, but this shows that in time all stars will reach such a mass.

If enough mass is input to stellar systems from the arms, fission, rather than fusion, may be the energy powering the younger stars up to say, F2 status. This would explain the recently noted lack of neutrinos emanating from our Sun.

At F2 there is a phenomenon which scientists call the F2 Discontinuity. Stars with lesser mass than F2 all appear to have small angular momentum, and those with larger mass have very much greater angular momentum. Angular momentum is a property of the rotation and revolution of the bodies in a system. In the Solar System most of the angular momentum is in the planets. If these are spiralling inwards, then it may be that at around F2 most stars swallow their first gas giant. That would explain the sudden increase in angular momentum. This increase itself would cause a sudden much greater spin-rate for the star, which in turn would have major effect on both the inner temperatures of the star and the reactions taking place there. It could well be sufficient to change a fission operated star into a fusion operated star.

This would also possibly explain the sudden change from an arithmetic mass progression below F2 to a geometric mass progression thereafter. Fission is an explosive process but fusion is implosive. Apart from gravity, the fusion process itself will suck in everything nearby.

There has been recent evidence to the effect that almost 80% of the mass of our universe is in the form of black holes. Eliptical galaxies for example, all appear to have about 60% more mass than is visible, and there is a great deal more missing mass all over the place. If almost all stars become black holes this would be explained. There would also be more than enough intense gravitational fields to fully account for the observed red shift. This would mean that the universe is not expanding. Red shift would have to be read as gravitation not recession. The correct answer to Olbers' Paradox would be that the sky is dark at night because most stars are black!

There never was a big bang. It simply never happened. Hubble's law would still work, though it would have nothing to do with recession, but the further away an object was the more intense gravitational fields would be traversed by its light en route to us, so the greater the red shift it would still have Strangely, de Sitter's point about there being an alternative universe which fits Einstein's equations remains true also, as a universe constantly losing mass into black holes would suit the criteria just as much as an expanding universe.

Problems

Cold cometary creation would also explain the rings recently found round the stars Vega and Formalhaut, by the IRAS satellite. Both are 'A' type stars, and would have built up good sized outer hydrogen ice rings. Planets would have swept up the inner material. Altair, another nearby 'A' type, should also show such a ring. The absence of one round Sirius may have something to do with the fact that it has a white dwarf as a double star.

There are always problems with any new theory, and this is no exception. Stellar mass accretion removes the possibility for stars to live out the lives expected of them by present astronomy. What then causes white dwarfs, neutron stars, and red giants?

When a double star is formed, orbiting another star's shock-wave, there will be a lot of interstellar gas and dust flying around. It will almost instantly create its own new hump to the shock-wave, and draw in much of the hydrogen ice crystals from the outer ring of its parent star, and maybe even the carbon and water ice rings as well. It may be enveloped in a cloud of such particles, possibly filling its shock-wave hump, for a million years or more, as all the particles gradually settled into the new situation, either by becoming drawn into the body of the new star, or simply rearranging their positions on the new joint ecliptic plain of the two stars. All such stars would appear to us as red giants before they settled down to normal 'M' type stars.

If our Sun, Sirius, Procyon, and Alpha Centauri travelled along in their present positions at their present velocities in a galactic arm, the dust between them would be sufficient to create 100,000 Suns! A few slight differences in their angle of motion and their shock-waves would act as a funnel, channelling all this material onto some unsuspecting star coming along behind. Such actions could explain supernovae. Smaller funnels might explain novae, and should be more common. A single star ahead might shed enough material into another star's system to fill its shock-wave with an opaque dust cloud. Possibly some such effect might explain what we see as white dwarfs. If so, they'd probably emerge again at a later date, bumped up the main sequence a few notches.

Unfortunately, the only answer I can come up with for neutron stars is 'Little Green Men' – which is what they thought pulsars were in the first place.

Aliens

One thing about shock-wave astronomy is that it does tell us exactly where the aliens are likely to be. It means that all stars will have planetary systems, and as these will all be spiralling inwards, there will always be one in or just leaving the star's ecosphere, or life-as-we-know-it habitable volume of space. Further, as stars are created small and build up in mass in this theory, those of around the same mass will tend to be around the same age, and those of a little more mass will be slightly older.

Accordingly, if we want to look for aliens slightly in advance of us, who can solve all our problems, all we need do is to look for the nearest slightly more massive star. The nearest G1 to us is Beta Hydri, at 21.3 light years. A number of more advanced stars are much closer however, and the most advanced of these is the much-loved SF aliens' abode, Sirius, at only 8.7 light years. Anybody living there could well be so advanced that Sirius B being a white dwarf, and all their planets being swallowed up, wouldn't worry them.

As you will appreciate, everything here is hypothetical. This whole astronomical scenario was created for a science fiction book, 'Laserblaster', which I was writing. Still, if it were true, it would certainly answer a number of presently unanswered questions. Any sensible letters would be appreciated if sent via the Editor at Hemel Hempstead.

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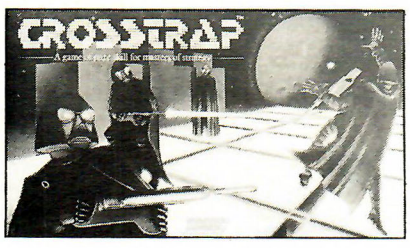
CROSS TRAP COMPETITION

By low editorial cunning *Space Voyager* has managed to obtain a copy of the new tactical boardgame, Crossplot, and in a moment of uncharacteristic benevolence we're going to part with it to the winner of this competition. Rules are the same as for the *Star Trek* books contest, and the address is 'Crossplot' at the Hemel Hempstead address. Without further ado: The contest –

1. What is the name of the proposed British space vehicle first displayed at Farnborough Airshow?
2. When is the centenary of the setting up of the Greenwich Meridian?
3. Who played Mike Donovan in the TV series *V*?
4. How much did UFP *Star Trek* Convention raise for charity?
5. What is MUSTARD?

That's it. The answers are all in this issue of Space Voyager. First correct entry out of the Captain's tricorn hat is the winner.



Communications Bank

Continued from page 25

2001 Errors: The story continues

I read Mr Conroy's recent letter with interest. Suction as an explanation for the fall of liquid down the straw? Does this not require that the container be rigid and intact? What if there is a collapsible plastic bag held inside a punctured, rigid outer container so that pressure equalisation occurs? Then one shouldn't get drawback by suction, in fact there should be a small inertial effect which continues the outflow when pressure is removed. Anyone know how these things work on STS?

Room for the carousel. Mr Conroy, you are right. I can only lamely add that I had had some vague thought in this direction myself.

Gravity in the pod bay. Right again Sir. The widely available picture (*Kubrick*, by Michel Ciment) shows Bowman striding along.

However, surely a machine such as the pod which is designed to perform complex movements and manipulations with its arms would be constructed with internal angular momentum counters? Otherwise it would need a computer supervised link-up between arm motions and verniers which is costly on fuel, and undesirable when near other delicate vehicles. Surely NASA has shown designs for screwdrivers which work like this?

I should add that Mr Conroy seems to be correct about the pod not blasting away when Bowman exits. One could suggest that the pod does actually fire its vernier automatically but, of course they are on the other side – away from the camera – but this is beginning to smack of excusemaking.

Finally I would be interested to know what Mr Conroy thinks of *2001*. To me it is a dear friend and these faults are its idiosyncracies.

Graduate Common Room *David Lane*
Christ Church Oxford

Doppler effect

With regard to Kenneth Mann's letter in *Space Voyager* 11, I rather expected that someone would nit-pick at my mention of the Doppler Effect in interstellar travel! I am of course well aware of Robert Forward's refutal of the 'starbow effect' – which you will notice I did not mention. But let's get this into perspective (no pun intended).

The Doppler Effect and the aberration it causes are real. As the speed approaches that of light, the stars would seem to be clustered more thickly ahead than behind the craft, until at 90% of light-speed less than 10% would lie to the rear. At the same time, the stars ahead would be blue-shifted because their waves are 'squashed', while those behind are red-shifted. True, for a time there will be little obvious change because as a star's visible radiation is shifted into the ultra-violet its infra-red will become visible, with the reverse to the rear.

But there aren't enough wavelengths to keep this going indefinitely, especially to the unaided eye. At a high fraction of light-speed, a Sun-type star ahead will eventually vanish. For navigational purposes, hot, blue supergiant stars in the rearward hemisphere should be used, according to James D. Wertz. Their radiation is strongest in the ultra-violet, so they will actually appear brighter at high velocities; similarly, red supergiants could be used in the forward cone of stars.

Hall Green Birmingham *David A. Hardy*

NEXT ISSUE

PLANET 10?
Patrick Moore looks round the skies for the enigmatic tenth planet of our Solar System. Does it in fact exist, and if so, where is it?

TANITH LEE
The prolific authoress of many an SF book is interviewed

TURLOUGH
Mark Strickson talks about his time travels in the Tardis

SHUTTLE UPDATE
What's happening in the Space Shuttle Programme. Latest news on the most recent flights

SO YOU WANT TO BE AN ASTRONAUT?
Andrew Nimmo will tell you just what the job prospects are and what qualifications you'll need

WHAT THE HITCH-HIKER WORE
Dee Robson designed the costumes for the BBC series, plus others for Dr Who and Blake's 7. We find out how

AND MORE. . .
All the regular features – book, model and product reviews, all the news, competitions, and your letters in the New Year edition of *Space Voyager*, on sale January 11, 85

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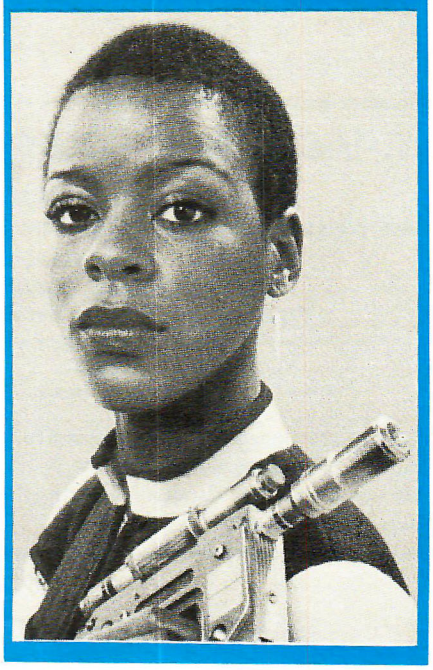

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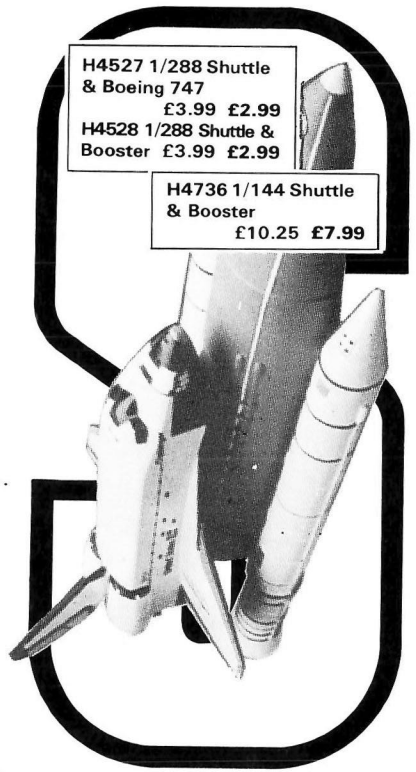

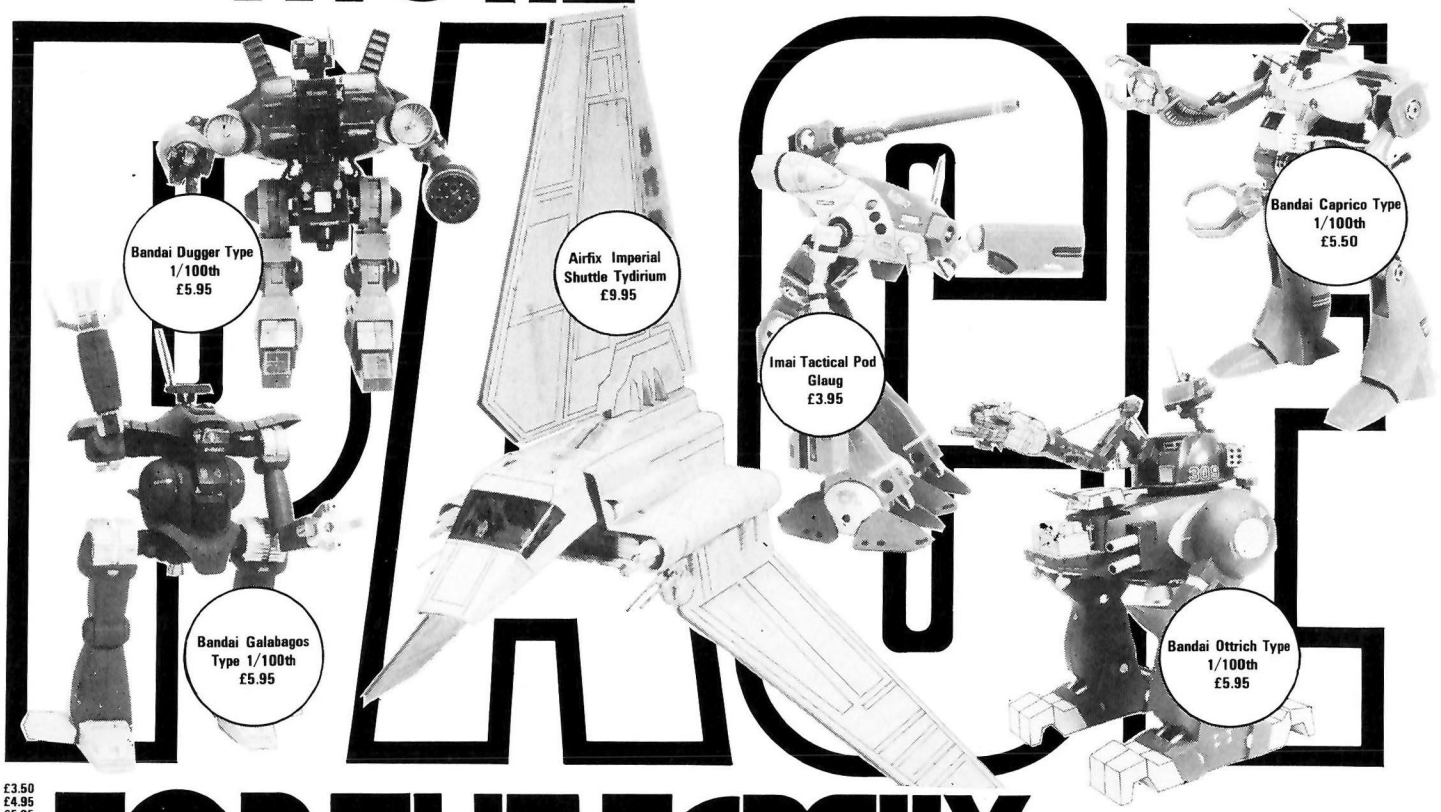
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